

## EP0758833

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Method and apparatus for providing an interactive guide to events available on an information network

Abstract:

Abstract of EP0758833

Apparatus and methods are provided for implementing an interactive program guide on an information network. A plurality of database pages are communicated over the information network. Each page corresponds to a time slot over which events are available on the network. Schedule data for each event to be included in the interactive guide is inserted into the database page for the time slot during which the event is to be provided. The database pages are transmitted via the information network at a transmission rate selected to enable the recovery of a particular database page within a predetermined acquisition time limit, for retrieval of schedule data for the time represented by that page. Schedule information for a current time period can be provided in a trickle data stream with future scheduling information provided in a demand data stream. The demand data stream is transmitted at a substantially higher rate than the trickle data stream. Data from the trickle stream is downloaded into memory at the decoder for instantaneous display. Data from the demand data stream is accessible on an as needed basis by retrieving only that data necessary for the display of scheduling information for a desired time slot.

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**(54) Method and apparatus for providing an interactive guide to events available on an information network**

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retrieval of schedule data for the time represented by that page. Schedule information for a current time period can be provided in a trickle data stream with future scheduling information provided in a demand data stream. The demand data stream is transmitted at a substantially higher rate than the trickle data stream. Data from the trickle stream is downloaded into memory at the decoder for instantaneous display. Data from the demand data stream is accessible on an as needed basis by retrieving only that data necessary for the display of scheduling information for a desired time slot.

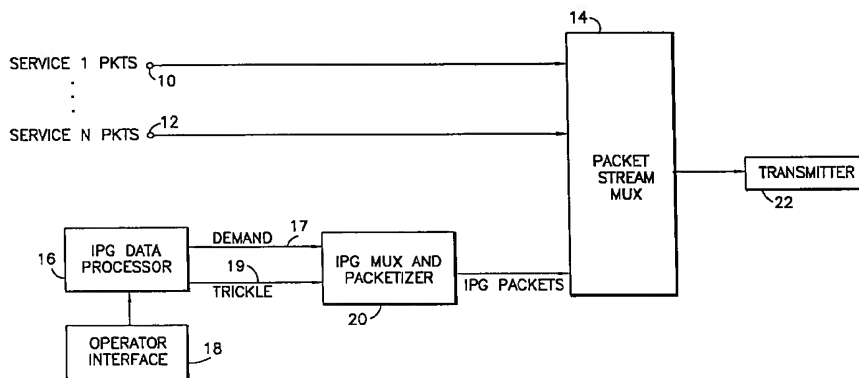


FIG. 1

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**Description**BACKGROUND OF THE INVENTION

5 The present invention relates to the provision of services over a communication network, and more particularly to an interactive guide to individual events available via an information network. The invention has particular applicability to the provision of an interactive program guide for events (e.g., television programs, movies, concerts, sporting events, interactive forums, and the like) available over a satellite or cable television network.

10 The availability of digital networks for the transmission of games, information services, television programming (including movies and special events), shop at home services, and the like, has vastly increased the number and variety of such services available to consumers. Systems with 500 or more programming channels are contemplated and are expected to be in operation in the near future. One challenge that has emerged in the development and design of such systems is how to keep consumers informed as to the scheduling of the many different events that are offered.

15 In the past, where cable and satellite television systems have generally provided less than 100 channels, weekly or monthly program guides have been printed and distributed by mail. Periodical publications, such as TV Guide, have been available for purchase at newsstands or by subscription. Obviously, any schedule changes made after the printing of the program guides will render such printed guides inaccurate. Further, for the contemplated systems of 500 or more channels, the sheer volume of entries renders the use of printed program guides expensive and inconvenient to use. The indexing of the large number of programs is a complex task and a consumer's search for a desired program may  
20 be extremely inconvenient.

A logical solution to the problem of providing an accurate, up-to-date guide for a large number of events is to provide the guide via an electronic medium. The communication industry is working toward the development of program guides that are downloaded to a subscriber terminal, such as a "set top box" connected to a subscriber's television, in order to provide program schedule information. One stumbling block in implementing such an electronic program guide  
25 is the amount of bandwidth required to carry the large amount of scheduling information over a communication channel. Another obstacle is the amount of memory required to store scheduling data for a week or more within the set top box. Such random access memory (RAM) is currently expensive. This conflicts with the requirement that a consumer set top box be a relatively inexpensive item.

Another problem faced by developers of electronic guides to events available over a communication network is the  
30 provision of the schedule information in a timely manner. Subscribers would grow impatient if the response time for providing scheduling information in answer to a query for such information for a particular time slot takes too long. In an ideal system, a subscriber would receive an immediate answer to a request for scheduling information pertaining to a particular time period. After obtaining scheduling information, a subscriber may desire to have further details about a particular program. Again, it would be inconvenient to wait for more than a few seconds in order to obtain descriptive  
35 information about a program. Ideally, the description information should be provided almost instantaneously after a request therefor.

It would be advantageous to provide an interactive guide to events that is economical in terms of both communication bandwidth and cost. It would be further advantageous to provide such an interactive guide that responds to user inquiries on an instantaneous or near instantaneous basis. It would be still further advantageous to provide an interactive  
40 service guide that can be received by a relatively inexpensive set top box, and which adapts to the amount of RAM available in a particular set top box. The method for providing the interactive service guide should enable more advanced set top boxes having more memory to respond to requests for schedule and description information even more rapidly than boxes having less memory.

The present invention provides a method and apparatus for implementing an interactive guide to events enjoying  
45 the above and other advantages.

SUMMARY OF THE INVENTION

In accordance with the method of the present invention, an interactive guide to events is provided via an information  
50 network. The interactive guide can be provided on the same network on which the events described by the guide are available. A plurality of database "pages" is provided for communication over the information network. Each page corresponds to a particular time slot, and includes data defining the titles of events offered during the time slot to which that page pertains. The pages may optionally include descriptions of the events. Thus, for each event that is to be included in the interactive guide, schedule data is inserted into the database page for the time slot(s) during which that event is  
55 to be provided. The database pages are transmitted via the information network at a transmission rate selected to enable the recovery of a particular database page within a predetermined acquisition time limit, for retrieval of schedule data for the time slot represented by that page. The predetermined acquisition time limit is selected to provide requested schedule information without undue delay as perceived by users of the system.

The schedule data can be representative of information services and messages identifying events provided by par-

particular information services at particular times. The method can comprise the further step of sorting the schedule data by information service and message type for insertion into the database pages in a preformatted form. The schedule data is transmitted in the preformatted form to facilitate the display of schedules by time slot at a decoder without performing the sorting at the decoder.

5 In an illustrated embodiment, the transmitting step transmits the database pages in a packetized transport stream in which different categories of data are carried in different packet streams. Each packet stream has a unique packet identifier (PID). The database pages are carried in at least one packet stream identified by a unique PID. In one embodiment, each of the database pages is carried in a separate packet stream having an unique PID for that page. An additional data stream can be provided containing foundation data necessary to decode the schedule data carried in the database pages. The additional data stream has its own PID.

10 The database pages can contain schedule data for time periods beyond a current time period. For example, they can contain data for a week or more beyond the current day. In a preferred embodiment, a separate stream of data is provided with schedule information for the current time period, e.g., the current day. The separate stream has its own PID and provides the schedule information for the current time period at a rate which is slower than the rate at which the schedule data carried in the database pages are provided. More particularly, the data for the current time period may be provided in a "trickle data stream," the data from which is stored in the RAM of a subscriber set top box or the like. The data for future time periods is carried in a "demand data stream" which carries the data at a much higher rate, for retrieval on a real time basis in response to a request for future scheduling information from a subscriber. Since the RAM available at the subscriber location will typically be less than that available to store all of the future schedule information, the provision of a separate high rate demand data stream in accordance with the present invention enables desired scheduling data to be retrieved without undue delay. The storage of current scheduling data in RAM enables the current data to be substantially instantaneously retrieved and displayed in response to a subscriber's request.

15 For each event to be included in the interactive guide, the schedule data can comprise a title record containing title information for that event and may optionally comprise a description record containing description information for that event. In this manner, the description information for an event can be processed at a decoder independently of the title information for that event. The insertion of the title and description records within the database pages can be allocated to communicate the title information at a higher rate than the description information. The title and description records for a time slot of interest may be stored in the memory of the decoder (e.g., a subscriber's set top box). The amount of memory available for storing the records can be monitored. In the event that the amount of memory available is less than that required to store the title and description records for a time slot of interest, description records can be purged to make room for the title records.

20 The schedule data can further comprise a schedule record for the time slot to which the schedule data pertains. The schedule record contains title and description record identifiers cross-referencing the start time for an event with the title and description records for that event. A decoder is disclosed that provides an interactive program guide (IPG) from data received via an information network on which events listed in the program guide are available. The decoder includes means for recovering IPG trickle data from the information network at a first data rate. The trickle data comprises current schedule information for storage in a decoder memory and substantially instantaneous display at any time during a current time period. Means are provided for selectively retrieving IPG demand data from the information network at a second data rate that is substantially faster than the first data rate. The demand data is provided in pages and comprises future schedule information. Each of the pages contains demand data for different future time slots. Means are provided for storing selectively retrieved pages of IPG demand data for display after the retrieval thereof from the information network.

25 The IPG trickle data and IPG demand data can be received from at least one packetized transport stream containing a succession of packets. The packets for the trickle data are identified by a first packet identifier (PID) and the packets for the pages of demand data are identified by at least one second PID. In one disclosed embodiment, each of the pages of IPG demand data corresponds to a different time slot and has a unique PID. Each such page of IPG demand data can alternatively have a unique page identifier, with a plurality of the pages being communicated under a common PID.

30 For each event to be included in the interactive guide, the schedule information can comprise a title record containing title information for that event and may optionally comprise a description record containing description information for that event. The decoder can further comprise means for retrieving schedule records from the current and future schedule information. The schedule records contain title and description record identifiers cross-referencing the start time for an event with the title and description records provided for that event. Means responsive to a user input are provided for selectively outputting title information for specific time slots and descriptions for specific programs based on information contained in the schedule records.

35 The decoder can further comprise means for monitoring an amount of memory available in the storing means. In the event that the amount of memory available is less than that required to store the title and description records for a time slot of interest, the description records can be purged to make room for the title records in the storing means. The decoder memory is preferably of a size sufficient to hold at least 24 hours of current schedule information. The trickle

data can then provide schedule information for at least a full day of events at a time.

As noted above, each of the pages can be carried in a separate packet stream having a unique PID for that page. In such an instance, the decoder can further comprise a first PID processor for acquiring schedule information contained in a first page for a first time slot. A second PID processor can be provided for acquiring schedule information contained in a second page for a second time slot that immediately follows the first time slot. Means are provided for selectively combining a portion of schedule information acquired by the first PID processor with a portion of schedule information acquired by the second PID processor to provide a schedule of events available during a time period spanning the first and second time slots.

A method is disclosed for providing an interactive program guide from data received via an information network on which events listed in the program guide are available. An IPG trickle data stream is provided at a first data rate. The trickle data stream comprises current schedule information for communication to and storage in a decoder. The trickle data stream enables instantaneous display of portions of the current schedule information on a display coupled to the decoder. An IPG demand data stream is provided at a second data rate that is faster than the first data rate. The demand data is provided in pages and comprises future schedule information. Each of the pages contains demand data for at least one different future time slot. The second data rate is chosen to enable the selective acquisition and display of portions of the future schedule information on the display within a predetermined acquisition time limit. The trickle data stream is transmitted at the first rate and the demand data stream is transmitted at the second rate over the information network for receipt by a population of decoders.

The current and future schedule information can be representative of information services and messages identifying events provided by particular information services at particular times. The method comprises the further step of sorting the schedule information by information service and message type for transmission to the decoders in a preformatted form. This facilitates the acquisition and storage of schedules by time slot at the decoders without performing the sorting at the decoder.

For each event to be included in the interactive guide, the schedule information can comprise a title record containing title information for that event and may optionally comprise a description record containing description information for that event. The description information for an event can then be processed at the decoders independently of the title information for that event. The method can comprise the further step of allocating the transmission of the title and description records within the demand data stream to communicate the title information at a higher rate than the description information.

#### BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a block diagram of various elements necessary to generate an IPG packet stream in accordance with the present invention;

Figure 2 is a block diagram of apparatus for receiving and decoding IPG data;

Figure 3 is a diagrammatic illustration showing a preferred method of communicating schedule information including title records and description records;

Figure 4 is a diagrammatic illustration illustrating the labeling of schedule data for different time slots with unique PIDs for each look ahead interval; and

Figure 5 is a diagrammatic illustration providing an example of how IPG data slots are assigned to PIDs to enable scheduling data to be provided at the interface between two consecutive time slots.

#### DETAILED DESCRIPTION OF THE INVENTION

Figure 1 is a block diagram of encoder apparatus for assembling and transmitting interactive program guide (IPG) packets in a multiplex with various services to be provided over a communication network. A packet stream multiplexer 14 receives data packets for N different services that are input to the multiplexer via a plurality of terminals 10, 12. IPG packets are also input to the packet stream multiplexer 14 for multiplexing with the data packets for the different services. The services can provide, for example, events such as television programs (e.g., via a network service), movies (e.g., via the HBO service), special sports events, shop at home services, information services, interactive forums, town meetings, and any other type of service available electronically via a communication network. The packet stream multiplex output from multiplexer 14 is transmitted over the communication network by a conventional transmitter 22. The communication network can comprise, for example, a satellite communication network, a cable television network or a telephone network.

IPG data is input to an IPG data processor 16 via an operator interface 18. The operator interface can comprise a workstation having a keyboard through which an operator inputs various scheduling information. Other input devices, such as optical character readers and voice recognition systems can also be used to input scheduling information to the IPG data processor. The scheduling information is typically organized by time slots within a particular day. The time slots can be any size, for example two, four, six, eight or 12 hours. For each event, a title can be provided together with

the time at which the event is available. A description of the event can also be provided as part of the IPG data input via the operator interface.

The IPG data processor outputs both a demand data stream 17 and a trickle data stream 19. The trickle stream is a low rate IPG stream that is used to improve the responsiveness and user friendliness of the program guide function by ensuring that the memory in a subscriber's decoder always holds a database which is up-to-date for current programming. Such an approach makes a "mini-guide" display option possible, where a partial program guide is displayed over a small portion of a user's television screen while the rest of the screen continues showing television programs or other available services. Whenever a user desires to view a portion of the program guide database that is not stored in the decoder memory, the desired portion is acquired from the high speed demand stream. Thus, trickle data does not need to be present for programs scheduled farther in the future than can be held in the available decoders having the largest IPG RAM allocation. All other data is provided via the demand stream.

To simplify implementation, it is preferable for the trickle stream to be formatted and constructed the same as the demand stream(s). Data blocks received from the trickle stream are filtered in firmware at the decoder to reject those representing data farther in the future than the particular decoder's RAM can hold. It is also preferable to provide only one trickle stream per multiplex, with all of the current scheduling data being carried in that single stream. The demand data, on the other hand, may be provided in a plurality of different data streams carried in the multiplex output from packet stream multiplexer 14.

The trickle and demand streams are multiplexed together and packetized in an IPG multiplexer and packetizer 20. The resultant IPG packets are input to the packet stream multiplexer 14 and combined with the packets for the various services carried in the transmitted multiplex, as indicated above.

By providing the most current schedule information (e.g., the schedules for the current day) in the decoder RAM, this information can be retrieved by a user without delay once the RAM has been loaded. The remaining data in the schedule database, i.e., the demand data, must be retrievable with as small a delay as reasonably possible within the constraints of system cost and complexity. Thus, if a user selects a time period of interest in the future, he must be able to see the program grid for the future time period (containing the schedule of events for that time period) in as short a time as possible. This time should not exceed several seconds. The program description information should be available no more than several seconds later (e.g., one to three seconds) for programs whose titles are visible on the screen. The necessary low acquisition time requires the delivery of IPG data not already stored in RAM at a high transmitted rate.

Even at high aggregate data rates (for example, in excess of one million bits per second - Mbps), the decoder must be able to keep up with the processing of messages received into its buffers. In a preferred embodiment, aggregate rates as high as four Mbps are provided.

The system of the present invention meets the objectives set forth above by addressing pages by time slot, filtering data slots and pages using firmware and/or hardware filtering, providing multiple PIDs to simplify the filtering required, delivering the data in a preformatted manner, and using separate data blocks to communicate title information and program description information. Data associated with timed events is page addressed, with the page number identifying a time slot. Timed events include substantially all of the data in the database except for foundation data. The foundation data is necessary to control the processing of the IPG functions, and includes compression (e.g., Huffman) code tables necessary to decompress title and description text, channel name tables, and various well known data required to properly process the packetized data stream to recover the information carried thereby.

Time slots are numbered sequentially in the preferred embodiment, e.g., starting at day zero of the global positioning satellite (GPS) time reference as well known in the art. Virtually any time slot size can be used. However, slot sizes of two, four, six, eight, twelve or twenty-four hours are preferable to simplify processing. The slot size for the trickle IPG data may be different than that used for the demand IPG data.

The IPG packets can be packetized using either a few PIDs or many PIDs. Firmware filtering is best suited for implementations using many PIDs, each carrying a few pages. Hardware filtering can efficiently handle many pages being carried on a few PIDs. If enough PIDs are available so that only one IPG data page is assigned to one PID, then only PID filtering is necessary to acquire the page(s) and associated time slot(s) of interest. If several pages are carried on each PID, firmware filtering can be performed after PID filtering, based on a unique page identifier for each page carried under the PID. In an example embodiment, where two hour time slots are provided and one week of schedule data is offered, a total of 85 PIDs may be supplied. Eighty-four of the PIDs are used for the 84 two hour time slots in a week (seven days = 168 hours) with one additional PID being provided for the foundation data. In such an embodiment, since each page has its own PID, no page filtering is required at the decoder.

The decoder of the present invention delivers the schedule data in a preformatted form. Although a decoder could be designed to accept and process individual database messages, such as daily schedules, title schedules and records, description schedules and records, etc., this approach would require substantial bandwidth overhead to deliver message headers and the like. Further, the requirement for such overhead would result in shorter message sizes, thereby creating additional processing overhead in the encoder and decoder. At the same time, the processing time to handle each message could limit the delivery rate, which would increase the acquisition time.

By delivering data to the decoders in preformatted blocks, efficient processing is provided, memory management waste is reduced, access time is reduced, and memory management is simplified. More particularly, by preformatting the schedule data at the transmitter side, operations such as sorting the data need only be performed once at the transmitter, and not at each of the millions of decoders that receive the IPG data. In addition to presorting the data, the IPG data is preformatted to provide relatively long messages (e.g., in one kilobyte segments) which are easier to process at the encoder where the streams are created as well as easier and faster to process and store in the decoder. By providing long messages, the decoder only needs to perform block copy operations necessary to construct a memory image, in order to keep up with the incoming flow of portions of the IPG database. Long messages also enable large blocks of memory to be allocated at the decoder, minimizing the overhead associated with the dynamic allocation of memory blocks. Processing time at the decoder is further reduced by allocating a large block of RAM for each of the large data blocks. No further central processing unit (CPU) overhead is required above that used to collect the memory image.

The delivery of preformatted IPG data to the decoders also enables entire blocks of IPG data to be purged from the decoder memory once the time slot associated with the data block has passed. Further, if the decoder RAM is running low, description data (as opposed to title data) can be purged, one slot at a time. The resulting RAM is left with large holes, rather than lots of small holes (i.e., fragmentation) that would slow the retrieval of the IPG data from the memory.

In the method and apparatus disclosed herein, the preformatted IPG data blocks are delivered to the decoders for direct storage in RAM. Moreover, the description records are logically separated from daily schedules and title records. This serves two purposes. First, the description records are large. In some instances, the decoder will not have enough RAM to hold descriptions for one or more time slots. Second, the description records can be distributed at a slower rate than the schedule and title records. This will enable the schedule and title records to be displayed very quickly, with a short wait, if necessary, for the description records.

An example of the format that can be used for the preformatted IPG data blocks is provided in Table 1, which sets forth the data block format in a C-language-like syntax that is a method of describing continuous and possible variable rate sequences of bits, instead of specifying a procedural program and its functions as in the computer language C. The first column of the syntax contains the syntax element. The second column gives the length of the syntax elements in bits. The third column of Table 1 gives the length of the syntax elements in bytes. The last column in Table 1 describes the information carried in various bits of the syntax element. The header "IPG\_data\_block(){...}" indicates that the syntax elements within the braces are a named set and may be invoked elsewhere in the syntax by simply using the designation "IPG\_data\_block()". A conditional occurrence of bit structures may be indicated with the usual "if" tests. The customary relational operators well known in the C-language are also available. Loop structures are possible and use the standard C loop header syntax. The syntax table is accompanied by a set of semantics, providing definitions for each previously undefined syntax field and placing constraints on their use. Five types of data blocks are defined, namely, schedule\_listings, descriptions, common\_listings, common\_descriptions, and foundation data. The following IPG prelinked record structure format represents a preferred embodiment of the present invention:

**TABLE 1**

	IPG_data_block(){	Bits	Bytes	Bit Number/Description
5	block_type_byte	8	1	
	reserved	4		7-4: reserved
	block_type	4		3-0: {foundation, common_listings, common_descriptions, schedule_listings, descriptions, rsvd1..N}
10	version	8	1	range 1-255
	if(block_type==foundation){			
	slot_sizes_field	24	(3)	
	reserved	12		23-12: reserved
	common_block_time_slot_size	4		11-8: {_2,_3,_4,_6,_8,_12,_24,_48,_168, rsvd1..N}
15	trickle_block_time_slot_size	4		7-4: {_2,_3,_4,_6,_8,_12,_24, rsvd1..N}
	demand_block_time_slot_size	4		3-0: {rsvd1, rsvd2,_4,_6,_8,_12,_24, rsvd3..N}
	}else{			
20	date	16	(2)	start of time period covered, days
	time	8	(1)	start of time slot, hours since mid.
	}			
	bundle_ID	8	1	range 0-255
	reserved	8	1	
25	data_block_length	24	3	units: bytes
	for(i==0; i<N; i++){			
	is_a_group_byte	8	(1)	
	is_a_group	1		7: {no, yes}
	reserved	7		6-0: reserved
	offset_to_next_group_or_source	24	(3)	0 indicates end of block
30	if(is_a_group){			
	reserved	8	((1))	
	group_ID	8	((1))	
	}else{			
	source_ID	16	((2))	
35	}			
	for(i==0; i<M; i++){			
	offset_to_next_message_type	24	((3))	0 indicates end of channel
	message_type_ID	8	((1))	
	for(i==0; i<P; i++){			
	long_message	1		{no, yes}
40	if(long_message){			
	message_length	15	((2))	(L) L=0 indicates end of group
	}else{			
	message_length	7	((1))	(L) L=0 indicates end of group
	}			
45	message_body()	8*L	((L))	
	}			
	word_alignment	0-8	((0-1))	
	}			
50	word_alignment	0-8	(0-1)	
	}			
	}			

55



**block\_type:** A 4-bit enumerated type field which identifies the type of IPG data block. The following C code defines the enumeration:

```
enum block_type { foundation, common_listings, common_descriptions, sched_listings,
descriptions, reserved1..N};
```

**version:** An 8-bit unsigned integer value in the range 1-255 which reflects the version or revision of the data contained in the block. Each time the database is updated (e.g., as a result of program changes, deletions or additions) a new version of the data block covering the affected time slot is generated.

**foundation:** The block contains untimed data (foundation data) rather than time-related data. The foundation type allows the same data block format to be used for untimed data, such as the compression tables, program theme classes, and channel names.

**common\_listings:** The block contains a single copy of each repeated program listing whose first occurrence is in the common\_block\_time\_slot covered by the common\_listings block. A repeated program listing is defined as a listing that is shown more than once, within the trickle database lookahead, either on an affiliated group of channels or on a single channel which does not belong to any group. No such listing shall be included in any

schedule\_listing block (see below). This block type applies to trickle data only.

5       **common\_descriptions:** The block contains a single copy of each repeated program description whose first occurrence is in the  
10       common\_block\_time\_slot covered by the common\_descriptions block. A repeated program description is defined as a description that is  
15       shown more than once, within the trickle database lookahead, either on an affiliated group of channels or on a single channel which does not belong to any group. No such description shall be included in any  
20       description block (see below). This block type applies to trickle data only.

25       **schedule\_listings:** The block contains daily schedules and program listings specific to each time slot. For trickle data, these listings correspond to single-show programs -- those which are shown  
30       only once within the lookahead.

35       **descriptions:** The block contains program descriptions specific to each time slot. For trickle data, these descriptions correspond to single-show programs -- those which are shown only  
40       once within the lookahead.

45       **common\_block\_time\_slot\_size:** A 4-bit enumerated type field which defines the time slot size in hours for common\_listings and  
50       common\_descriptions blocks. The slot size for these  
55       common data blocks shall be selected so that it is

an integer multiple of, or equal to, the slot size used by the trickle data blocks. The following C statement defines the enumeration:

```
enum common_block_time_slot_size {two_hours, three_hours, four_hours, six_hours,  
eight_hours, twelve_hours, twenty_four_hours, forty_eight_hours,  
one_hundred_sixty_eight_hours, reserved1..N};
```

**trickle\_block\_time\_slot\_size:** A 4-bit enumerated type field which defines the time slot size in hours for the trickle schedule\_listing and description blocks. The following C statement defines the enumeration:

```
enum trickle_IPG_time_slot_size {two_hours, three_hours, four_hours, six_hours,  
eight_hours, twelve_hours, twenty_four_hours, reserved1..N};
```

**demand\_block\_time\_slot\_size:** A 4-bit enumerated type field which defines the time slot size in hours for the demand schedule\_listing and description blocks. The following C statement defines the enumeration:

```
enum trickle_IPG_time_slot_size {reserved1, reserved2, four_hours, six_hours, eight_hours,  
twelve_hours, twenty_four_hours, reserved3..N};
```

**time:** An unsigned integer in the range 0 to 23 which represents the hour in the day which is the starting point for data defined in this block. The time field is ignored for foundation data blocks.

**date:** An unsigned integer in the range 0 to 0xFFFF, representing the day for which schedule data is carried in the block. Day zero is January 6th, 1980 (GPS day zero). The date field is ignored for foundation data blocks.

**bundle\_ID:** Channels are logically divided into "bundles" to efficiently accommodate different channel configurations at the set-top units. The bundle\_ID is an 8-bit unsigned integer in the range 0 to 255 identifying each bundle of source channels and groups. The value 0 defines the "common bundle" which includes channels common to all configurations; while other values of bundle\_ID identify configuration specific bundles. Typically, a set-top converter requires bundle 0 and one or more other bundles for its configuration.

**data\_block\_length:** A 24-bit count of the number of bytes to follow in the block.

**offset\_to\_next\_group\_or\_source:** A 24-bit number representing the distance in bytes to the next group of source channels or the next source channel, i.e., the length of all data to follow for the specified group\_ID or source\_ID. This field is ignored for the foundation blocks.

**group\_ID:** The identity of the affiliated channel group to which the messages to follow apply. When `is_a_group` is set, the listing and description record IDs are shared among all the source channels in the group. This field is ignored for the foundation block.

**source\_ID:** The identity of the channel to which messages to follow apply. The `source_ID` uniquely defines the channel's identity. This field is ignored for the foundation blocks.

**offset\_to\_next\_message\_type:** A 24-bit number representing the distance in bytes to the next type of messages.

**message\_type:** The IPG message type common to all messages to follow.

**long\_message:** A Boolean flag which indicates, when set, that the message length is a 15-bit field. When clear, the message length field is 7 bits.

**message\_length:** A 7 or 15-bit field defining the length of the message body to follow.

**message\_body():** The body of one given IPG message. The header portions are not stored, but their contents are reflected in fields such as the `group_message_type` and message length.

**word\_alignment:** These fields supply from zero to one byte of padding, used to bring the particular part of the block to a word boundary, for processing and addressing efficiency.

The following are examples of IPG message types that can be provided:

attribute name, class name, named class assignment, sortable class assignment, sortable subclass assignment, translation table, decode table, clear data, database lookahead, source name, schedule record, program title, program description, program package, pay-per-view program, etc.

An example of the structure of one particular IPG message type, namely the schedule record, is provided hereinafter in the discussion of Figure 3. As is evident from Table 1, messages are sorted first by channel number (`source_ID`) and then by message type. The innermost loop lists a number of messages in a "group" of messages having a common message type.

The prelinked demand IPG data blocks are delivered as high speed messages in multiple PIDs. Prior to transmission, the data blocks can be formatted into text messages and encapsulated within transport frames (e.g., high level data link control-"HDLC"-frames) for output from a serial output port for eventual transmission.

The `IPG_data_block()` itself is transported to the decoder in a manner that is compatible with the delivery of digital services on a digital multiplex. In an MPEG-2 compatible system, of which the preferred embodiment is an example, the

IPG\_data\_block () is placed inside a message header which includes message type (MPEG Table\_ID) and length. The whole message is packetized according to the packetization rules defined for MPEG-2 multiplexes and delivered in a PID stream referenced by an MPEG "Program Map Table" (PMT).

Another function of the message header is to provide segmentation control. Typically, one particular instance of an IPG\_data\_block() is larger than 1024 bytes and thus may have to be segmented for delivery.

The transmitted messages are received by a population of receivers via the communication channel which can comprise, for example, a satellite link or cable television distribution path. A block diagram of the pertinent portions of an example receiver implementation is provided in Figure 2. A data receiver 32 receives the transmitted data stream via an input terminal 30. The received data is provided to a packet stream demultiplexer 34 that outputs the demand and trickle IPG data packets to an IPG microprocessor 36. Other packets in the transport stream, which may include video and audio packets, are also output from the packet stream demultiplexer 34.

Microprocessor 36 separately processes the demand and trickle data streams. Demand processing is provided as indicated at 40, at a rate established by the incoming data products. Trickle processing is provided as indicated at 44, at a rate determined by the incoming trickle data. In a preferred embodiment, the demand processing occurs at a much higher rate than the trickle processing. For example, the data rate for the demand stream will be on the order of 1-2 Mbps, while the data rate of the trickle stream will be on the order of ten kilobits per second (Kbps). Since the trickle data is stored locally in the receiver's memory, there is no need for it to be provided in a high rate data stream as it will be instantly accessible from the decoder RAM.

Loading of the trickle data as well as selective portions of the demand data into system RAM 50 is controlled by a memory manager 48 coupled to microprocessor 36. The memory manager will address the RAM 50 in a conventional manner to store the trickle and demand data for subsequent retrieval by the microprocessor and display on a monitor 54 or the like coupled to a video processor 52. Selection of particular time slots of future scheduling information carried in the demand data stream is made via a user interface 46. The user interface can comprise, for example, a remote control coupled to input instructions to microprocessor 36 in a well known manner.

One function of memory manager 48 is to monitor the amount of free memory available in the system RAM 50. In the event that the amount of memory available is less than that required to store the title and description records for a time slot of interest, the memory manager can purge description records from the system RAM in order to make room for all of the title records. In this manner, the title information will be immediately available to a user once it has been downloaded into the system RAM. If there is not enough room to store the corresponding description information, the description record for an event requested by a user can be obtained from the demand data stream on an as needed basis. Since the demand data is transmitted at a high rate, the acquisition time for a requested description not already stored in system RAM 50 will be fairly short.

Preferably, the amount of system RAM 50 allocated for IPG data will be enough to hold at least 24 hours of current schedule information. Thus, schedule information for at least a full day of events at a time can be accommodated. In the preferred embodiment, all of the scheduling information for at least the current day's events will be provided in the trickle data stream for downloading into system RAM 50.

In an embodiment wherein the data carried by the demand and trickle streams is provided in separate pages, and each of the pages is carried in a separate packet stream identified by a unique PID in the transport multiplex, microprocessor 36 can provide first and second PID processors for acquiring schedule information spanning two consecutive time slots. The separate PID processors could be implemented in either hardware or firmware. The first PID processor will acquire schedule information contained in a first page for a first time slot. The second PID processor will acquire schedule information contained in a second page for a second time slot that immediately follows the first time slot. The microprocessor will selectively combine portions of schedule information acquired by the first and second PID processors to provide a schedule of events available during a time period spanning the first and second time slots. The combined schedule is output to video processor 52 for display on display 54.

In order to simplify the processing provided by microprocessor 36, a service carried on the information network can be divided among a plurality of different data streams, each having its own PID. Processing is simplified in such an embodiment because the individual data rates are smaller. At higher data rates, hardware filtering may also be required.

There are two different types of elementary PIDs which make up the demand IPG download service. One type carries only records describing time slots. The other type carries foundation data. The records describing time slots include daily schedule/title records and description records. In a preferred embodiment of the present invention, the records describing time slots are carried in the form of a "schedule record" that combines title and description information into a daily schedule. An example of such an IPG data record structure is illustrated in Figure 3. It should be appreciated that many other message types are transmitted in a similar manner.

A schedule record generally designated 60 is identified by source\_ID (SID) 62 and date 64. This information is not stored in the message body portion of the IPG data block carrying the record, since it can be found within the header portions of the block at various levels. Schedule records are transmitted in the form of N blocks (one block per time slot), each block defining all title and description records via title record IDs 68 and description record IDs 70, indexed by the start time 66 for the particular program or event. Each of the N blocks contains the title and description information for

all events within a particular time slot.

Each title record 80 contains compressed text defining the title of the program or event. The title record also includes a class ID 82, title attributes 84 and a rating 86. Class IDs 82 provide a set of sortable theme classes and theme subclasses for use in selecting schedule categories by a particular theme, such as sports, movies, comedy, etc.

They can also be used, e.g., to identify the record as a title record, or to identify a service as a pay-per-view or non-pay-per-view event. Title attributes are used to represent various text messages in a compressed form. For example, a plurality (e.g., 12) attribute bits may be provided, each representing a different message relating to the events provided. For television programs, example messages that can be indicated by different attributes are "stereo," "premier," "rerun" "series," "special event," etc. Ratings 86 are taken from the standard ratings for movies and are used as guidelines as to the nature of the movie's content. The actual program title 88 is also provided in the title records 80.

Description record 90 comprises a theme class ID 92, description attributes 94, the actual program description 96 (which may be compressed) as well as the year 98 in which the program was first released. Rating information 72 and a class ID 74 is also provided in the description record. The description attributes can be the same as or different from the attributes in the title records. The theme class ID is like the class ID of the title record, and identifies the type of event, such as sports, movies, comedy, talk show, children's program, etc. The class ID identifies the record as a description record. The structure of the title and description records makes it possible to convey information in a service database to the system users in an extremely versatile manner.

Table 2 sets forth the structure of the schedule record in detail. The shaded areas of Table 2 are not stored in the message body portion of the IPG data block, since they can be found within the header portions of the block at various levels. Further, the daily\_schedule message can include title/description references for an entire day or any portion of a day. Thus, the schedule record structure can handle any desired slot size.

**TABLE 2**

	Bits	Bytes	Bit Number/Description
<code>daily_schedule_message(){</code>			
<code>  group_schedule_byte</code>	8	1	
<code>  reserved</code>	7		7-1: reserved
<code>  group_schedule</code>	1		0: {no, yes}
<code>  if (group_schedule){</code>			
<code>    reserved</code>	8	(1)	
<code>    group_ID</code>	8	(1)	
<code>  }else{</code>			
<code>    source_ID</code>	16	(2)	
<code>  }</code>			
<code>  schedule_date</code>	16	2	days
<code>  number_of_entries_field</code>	8	1	
<code>  reserved</code>	2		7-6: reserved
<code>  number_of_entries</code>	6		5-0: range 0 - 63
<code>  for(i=0; i&lt;number_of_entries; i++){</code>			
<code>    program_listing_reference</code>	24	(3)	
<code>    listing_ID</code>	12		23-12:
<code>    description_present</code>	1		11: {no, yes}
<code>    start_time</code>	11		10-0: min. since midnight
<code>    if (description_present is set){</code>			
<code>      description_ID_reference</code>	16	((2))	
<code>      reserved</code>	4		15-12:
<code>      description_ID</code>	11		11-0:
<code>    }</code>			
<code>  }</code>			
<code>}</code>			

When **group\_schedule** is set, the schedule is assigned to a group of sources, instead of a single source. When **group\_schedule** is false, and the source belongs to an affiliated group, the daily schedule is an exception schedule; i.e., the daily schedule defines the differences between the source's schedule and the base-line group schedule. When **group\_schedule** is false, and the source does not belong to an affiliated group, then the schedule uniquely defines the day's programming for the independent source.

**group ID** specifies the identity of the group to which the daily schedule is assigned.

**source\_ID** specifies the identity of the source to which the daily schedule is assigned.

**schedule date** specifies the calendar day (day 0 = January 6, 1980) of the daily schedule.

**number of entries** specifies the number of programs referenced by the daily schedule.

**listing\_ID** identifies the program listing shown at the given **start\_time**.

**description\_present** indicates whether a program description record is referenced for the given **start\_time**.

**description\_ID** identifies the program description shown at the given **start\_time**.

If desired, the data blocks in the IPG stream can be arranged such that description records are repeated at a lower rate than schedule/title data. One arrangement is to skip the description records in every other pass through the data. In another arrangement, the data is interleaved and organized with all of the schedule/title blocks being provided interleaved with a first half of the descriptions, and then all of the schedule/title blocks being transmitted interleaved with the second half of the description data. This format would repeat so that only half of the descriptions are sent at any one time with all of the schedule/title blocks.

Figure 4 illustrates the arrangement of the IPG data over a look ahead interval. For example, the trickle data stream may contain scheduling information for a current 24 hour period and the demand data stream may contain information for the current period plus an additional six days to provide schedule information for a one week period. For the demand data stream, the look ahead interval 106 is therefore seven days. The seven day interval is broken down by time slots (e.g., two hours at a time) as indicated on time line 100. The schedule data is organized by slot. Thus, all of the schedule data for a first time slot is provided in a first page 102a which is identified by a unique PID (PID 1). Each successive page of data for each successive time slot will be identified by its own PID. The last slot in the look ahead interval is occupied by page 104a, having PID N.

The same format is used for the next seven day look ahead interval. The first slot of the next look ahead interval is occupied by page 102b, the packets of which are identified in the packet stream by PID 1. The last slot in the second look ahead interval illustrated in Figure 4 is occupied by page 104b. The data packets carrying the scheduling information for page 104b are identified by PID N. This format continues indefinitely for successive look ahead intervals.

Figure 5 illustrates a scheme for assigning IPG data slots to PID\_select (PIDS). PID\_select is used to select the PID in which a particular data block is to be transmitted to the decoder.

Slots containing timed IPG data blocks are numbered sequentially, e.g., starting at GPS day zero. In general, if N PIDs are to be used, the slots will be partitioned into groups of size N. The first slot in each N-slot group is assigned to PIDS 0 (i.e., PID\_select = 0). The second slot will be assigned to PIDS 1, and so on. Figure 5 illustrates such an assignment with an example for four PIDs, an eight hour slot size and a 21 slot (i.e., one week) database look ahead. Each slot 110 contains both schedule/title data blocks 112 and description data blocks 114.

The IPG data slot to PIDS assignment illustrated in Figure 5 always guarantees that two consecutive slots are assigned to two distinct PIDs. This is due to the staggered assignment of slots to the PIDs. As a result, the data acquisition/processing task can be divided evenly between two PID processors (e.g., implemented in firmware in microprocessor 36 - Figure 2) in the event that two slots are required to compose a scheduling grid for display to a user. Further, in preparing for time transitions (e.g., at slot boundaries if the slot size is two hours, or at two hours into each slot if the slot size exceeds two hours), only two out of the N PIDs (assuming  $N > 1$ ) need to be updated by removing a past slot and adding a future slot.

Referring to Figure 5, since the slot size (eight hours) is larger than two, the update is performed at two hours into slot 127 (i.e., at 10:00 a.m. on the seventeenth day of the month, with the current time falling in slot 126). This requires removing slot 126 from PIDS 2 and adding slot 147 to PIDS 3, as indicated at 110'. The other PIDS (PIDS 0 and 1 in slots 128, 129) remain intact, although versions may change for the data blocks in each PID. This approach allows smooth transitions to a new service definition at the transition times without disrupting the processing in the decoder.

It should now be appreciated that the present invention provides a method and apparatus for communicating and processing an interactive guide to events via an information network that carries various information services. An event listed in the interactive guide is available by subscribing to the information service that offers the event or by purchasing the event on an individual basis. The data for the interactive guide can be communicated in both a trickle data stream for current schedule information and a demand data stream for future schedule information. The current data from the trickle data stream is stored at the receiver for instantaneous retrieval. The demand data is cyclically provided in a high speed data stream for selective retrieval of schedule information for a time period of interest. Title and description records are transmitted separately so that title information can be retrieved from the demand data stream rapidly, with description information following at a slower pace if necessary to maintain data flow within the constraints of the system bandwidth and decoder memory resources. The scheduling data can be transmitted in a preformatted manner, to reduce the amount of processing necessary at the decoder.

The transmitted scheduling data can be provided in a packetized transport stream in which different categories of data are carried in different packet streams, each packet stream having its own packet identifier (PID). Prompt retrieval and processing of the scheduling data at the decoder is facilitated by providing individual pages from the scheduling database, organized by time slot, in the transmitted data stream with each page having its own PID. In this manner,



when a user selects a time slot for which scheduling information is desired, the decoder need only locate the PIDs for that time slot and all of the necessary program guide information can be retrieved from the packets transmitted under that PID. A separate packet stream is provided for foundation data, under a PID identifying the data as foundation data.

Memory management at the decoder can allocate available memory resources to maintain instantaneous access to current schedule information provided by the trickle data stream, while allocating memory to the demand data stream on an as needed basis.

Although the invention has been described in connection with various preferred embodiments, it should be appreciated that numerous adaptations and modifications may be made thereto without departing from the spirit and scope of the invention as set forth in the claims.

## Claims

1. A method for providing an interactive guide to events via an information network on which the events are available, comprising the steps of:

providing a plurality of database pages for communication over said information network, each page corresponding to a time slot over which events are available on the network;  
 inserting schedule data for each event to be included in the interactive guide into the database page for the time slot during which the event is to be provided; and  
 transmitting said database pages via said information network at a transmission rate selected to enable the recovery of a particular database page within a predetermined acquisition time limit, for retrieval of schedule data for the time slot represented by that page.

2. A method in accordance with claim 1 wherein said schedule data is representative of information services and messages identifying events provided by particular information services at particular times, said method comprising the further step of:

sorting said schedule data by information service and message type for insertion into the database pages in a preformatted form, said schedule data being transmitted in said preformatted form to facilitate the display of schedules by time slot at a decoder without performing said sorting at the decoder.

3. A method in accordance with claim 1 or 2 wherein:

said transmitting step transmits said database pages in a packetized transport stream in which different categories of data are carried in different packet streams, each packet stream having a unique packet identifier (PID); and

said database pages are carried in at least one packet stream identified by a unique PID.

4. A method in accordance with claim 3 wherein:

each of said database pages is carried in a separate packet stream having a unique PID for that page.

5. A method in accordance with claim 4 comprising the further step of:

providing an additional data stream containing foundation data necessary to decode the schedule data carried in said database pages, said additional data stream having its own PID.

6. A method in accordance with claim 3 comprising the further step of:

providing an additional data stream containing foundation data necessary to decode the schedule data carried in said database pages, said additional data stream having its own PID.

7. A method in accordance with one of claims 1 - 6 wherein said database pages contain schedule data for time periods beyond a current time period, said method comprising the further steps of:

providing a separate stream of data containing schedule information for said current time period, said separate stream having its own PID and providing the schedule information for said current time period at a rate which is slower than the rate at which the schedule data carried in said database pages are provided.

8. A method in accordance with claim 7 wherein said current time period is a current 24 hour period.

9. A method in accordance with one of claims 1 - 8 wherein for each event to be included in the interactive guide, said schedule data comprises a title record containing title information for that event and may optionally comprise a description record containing description information for that event, whereby the description information for an event can be processed at a decoder independently of the title information for that event.

10. A method in accordance with claim 9 comprising the further step of allocating the insertion of said title and description records within said database pages to communicate said title information at a higher rate than said description information.

11. A method in accordance with claim 10 wherein said title and description records for a time slot of interest are stored in a memory of said decoder, comprising the further steps of:

monitoring an amount of memory available for storing said records; and  
in the event that the amount of memory available is less than that required to store the title and description records for a time slot of interest, purging description records to make room for said title records.

12. A method in accordance with claim 9 wherein said title and description records for a time slot of interest are stored in a memory of said decoder, comprising the further steps of:

monitoring an amount of memory available for storing said records; and  
in the event that the amount of memory available is less than that required to store the title records for a time slot of interest, purging description records from said memory to make room for said title records.

13. A method in accordance with one of claims 9 - 12 wherein said schedule data further comprises a schedule record for the time slot to which the schedule data pertains, said schedule record containing title and description record identifiers cross-referencing the start time for an event with the title and description records for that event.

14. A decoder for providing an interactive program guide (IPG) from data received via an information network on which events listed in the program guide are available, comprising:

means for recovering IPG trickle data from said information network at a first data rate, said trickle data comprising current schedule information for storage in a decoder memory and substantially instantaneous display at any time during a current time period;  
means for selectively retrieving IPG demand data from said information network at a second data rate that is faster than said first data rate, said demand data being provided in pages and comprising future schedule information, each of said pages containing demand data for different future time slots; and  
means for storing selectively retrieved pages of IPG demand data for display after the retrieval thereof from said information network.

15. A decoder in accordance with claim 14 wherein said IPG trickle data and IPG demand data is received from at least one packetized transport stream containing a succession of packets, the packets for said trickle data being identified by a first packet identifier (PID) and the packets for said pages of demand data being identified by at least one second PID.

16. A decoder in accordance with claim 14 or 15 wherein each of said pages of IPG demand data corresponds to a different time slot and has a unique PID.

17. A decoder in accordance with one of claims 14 - 16 wherein each page of IPG demand data corresponding to a different time slot has a unique page identifier, and a plurality of said pages is communicated under a common PID.

18. A decoder in accordance with one of claims 14 - 17 wherein for each event to be included in the interactive guide, said schedule information comprises a title record containing title information for that event and may optionally comprise a description record containing description information for that event, said decoder further comprising:

means for retrieving schedule records from said current and future schedule information, said schedule records containing title and description record identifiers cross-referencing the start time for an event with the title and description records provided for that event; and  
means responsive to a user input for selectively outputting title information for specific time slots and descriptions for specific programs based on information contained in said schedule records.

19. A decoder in accordance with claim 18, further comprising:

means for monitoring an amount of memory available in said storing means; and  
in the event that the amount of memory available is less than that required to store the title and description  
records for a time slot of interest, purging description records to make room for said title records in said storing  
means.

20. A decoder in accordance with one of claims 14 - 19 wherein said decoder memory is of a size sufficient to hold at  
least 24 hours of current schedule information and said trickle data provides schedule information for at least a full  
day of events at a time.

21. A decoder in accordance with one of claims 14 - 20 wherein each of said pages is carried in a separate packet  
stream having a unique PID for that page, said decoder further comprising:

a first PID processor for acquiring schedule information contained in a first page for a first time slot;  
a second PID processor for acquiring schedule information contained in a second page for a second time slot  
that immediately follows said first time slot; and  
means for selectively combining a portion of schedule information acquired by said first PID processor with a  
portion of schedule information acquired by said second PID processor to provide a schedule of events avail-  
able during a time period spanning said first and second time slots.

22. A method for providing an interactive program guide (IPG) from data received via an information network on which  
events listed in the program guide are available, comprising the steps of:

providing an IPG trickle data stream at a first data rate, said trickle data stream comprising current schedule  
information for communication to and storage in a decoder to enable instantaneous display of portions of said  
current schedule information on a display coupled to the decoder;  
providing an IPG demand data stream at a second data rate that is faster than said first data rate, said demand  
data being provided in pages and comprising future schedule information, each of said pages containing  
demand data for at least one different future time slot, said second data rate being chosen to enable the selec-  
tive acquisition and display of portions of said future schedule information on said display within a predeter-  
mined acquisition time limit; and  
transmitting said trickle data stream at said first rate and said demand data stream at said second rate over  
said information network for receipt by a population of decoders.

23. A method in accordance with claim 22 wherein said current and future schedule information is representative of  
information services and messages identifying events provided by particular information services at particular  
times, said method comprising the further step of:

sorting said schedule information by information service and message type for transmission to said decoders  
in a preformatted form, thereby facilitating the display of schedules by time slot at the decoders without per-  
forming said sorting at the decoder.

24. A method in accordance with claim 22 or 23 wherein for each event to be included in the interactive guide, said  
schedule information comprises a title record containing title information for that event and may optionally comprise  
a description record containing description information for that event, whereby the description information for an  
event can be processed at said decoders independently of the title information for that event.

25. A method in accordance with claim 24 comprising the further step of allocating the transmission of said title and  
description records within said demand data stream to communicate said title information at a higher rate than said  
description information.

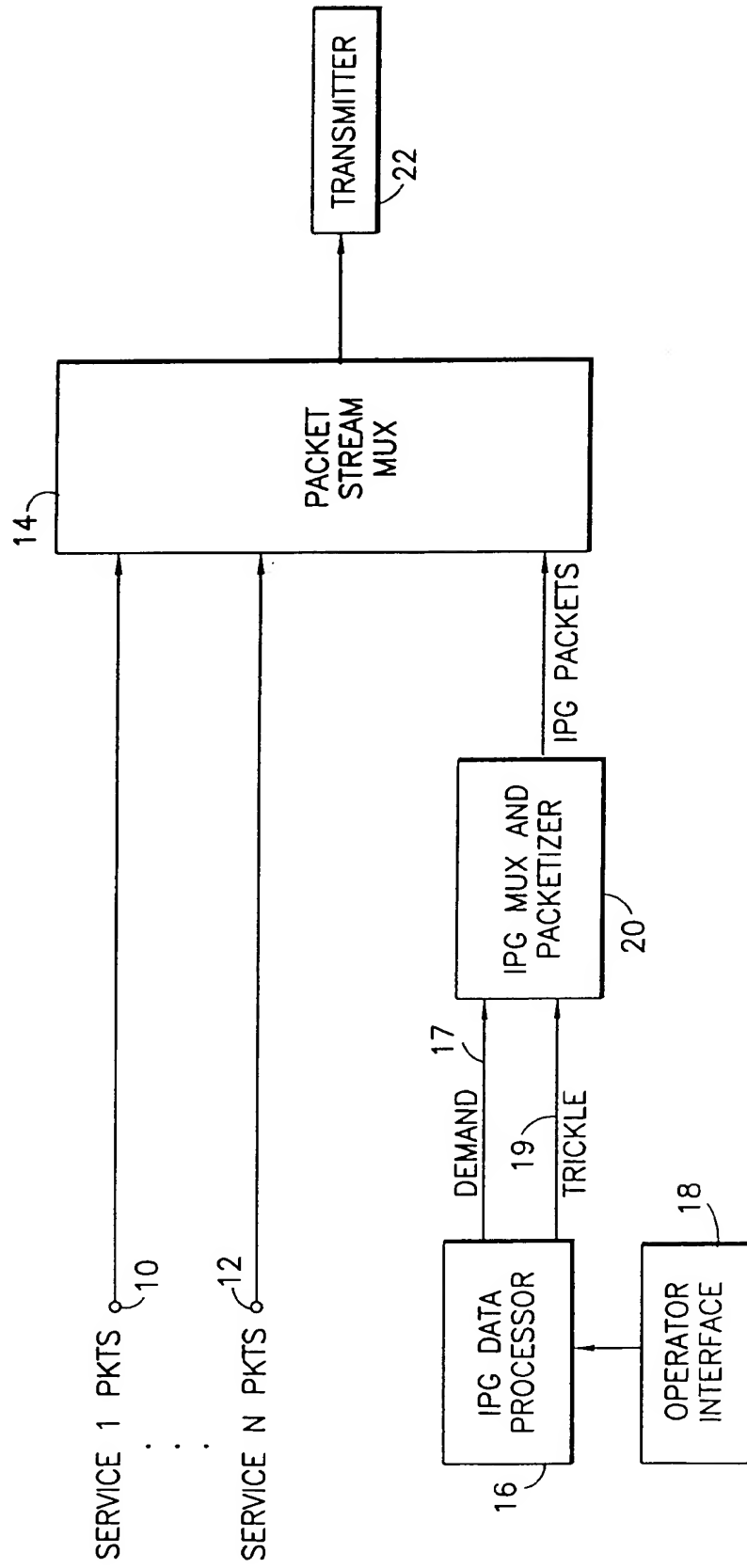
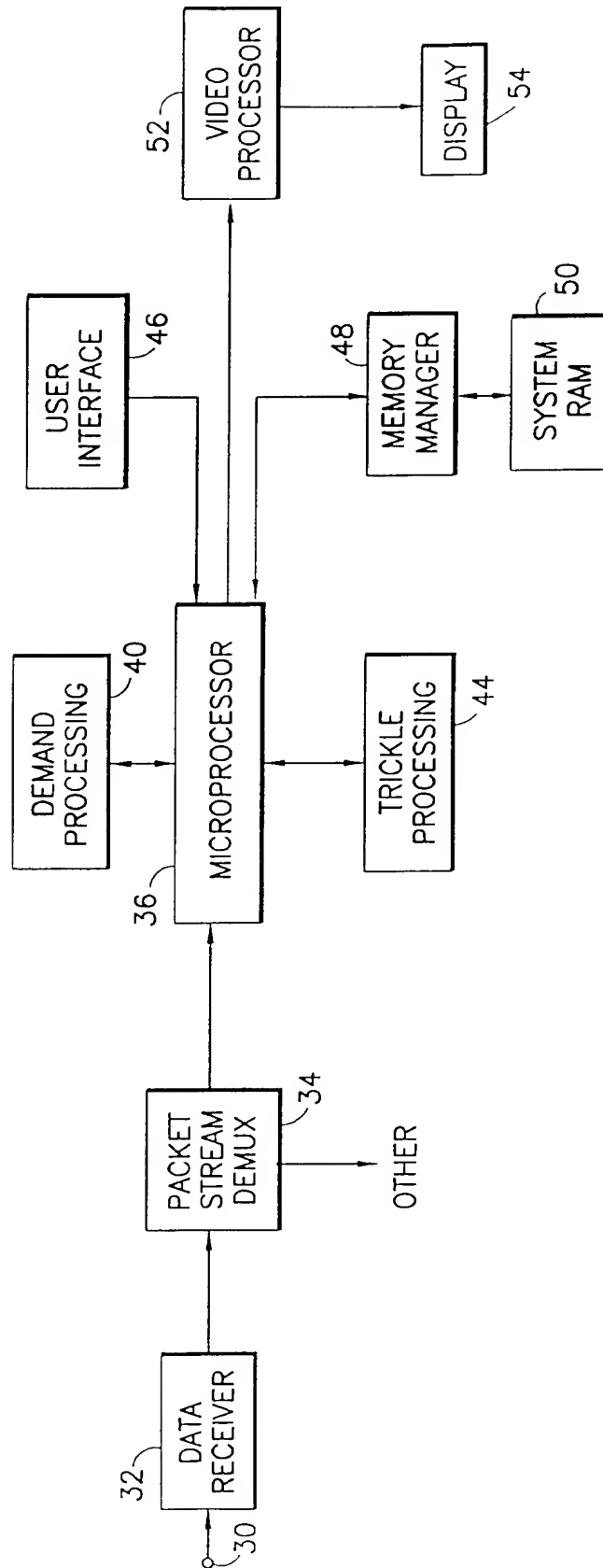


FIG. 1

FIG. 2



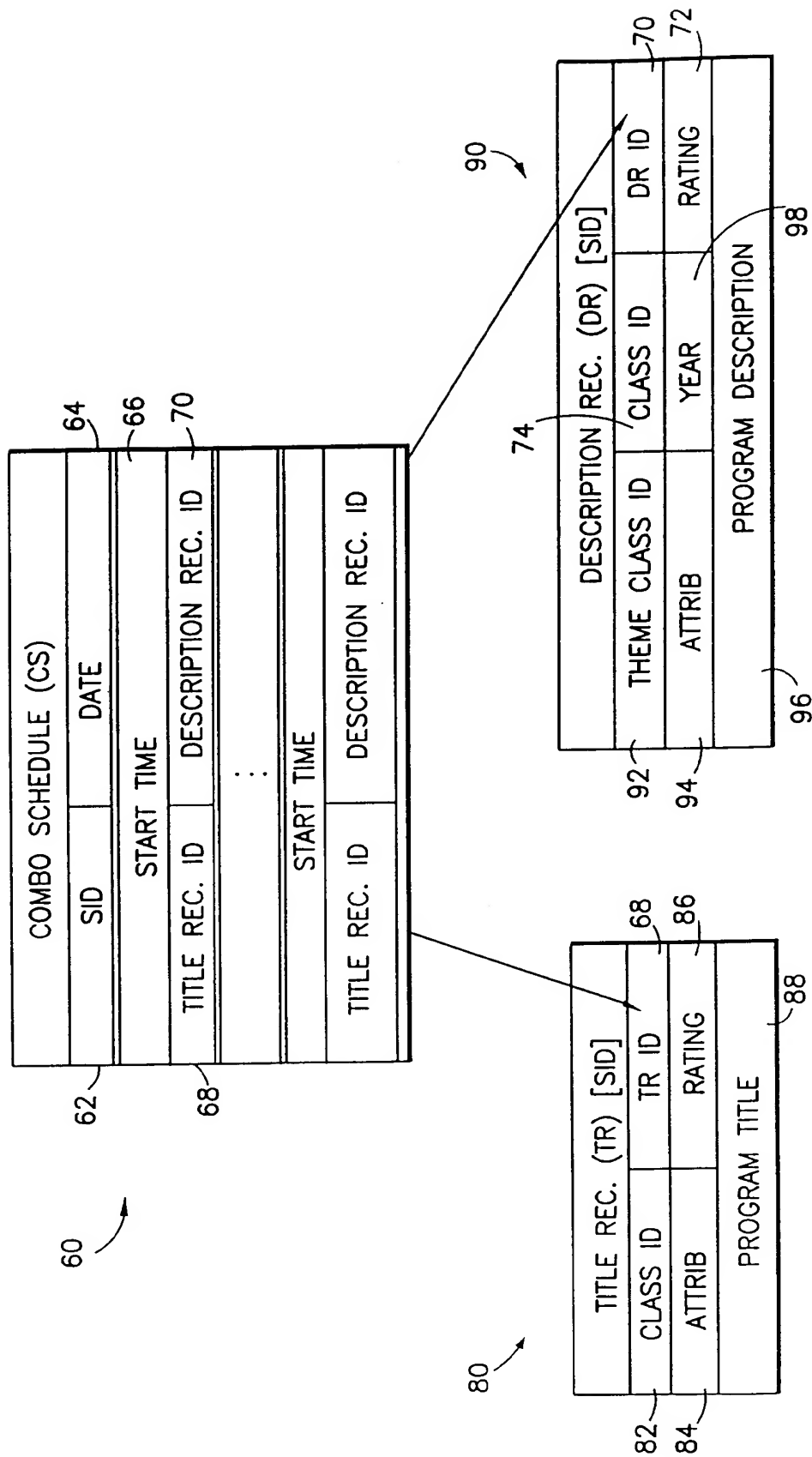


FIG. 3

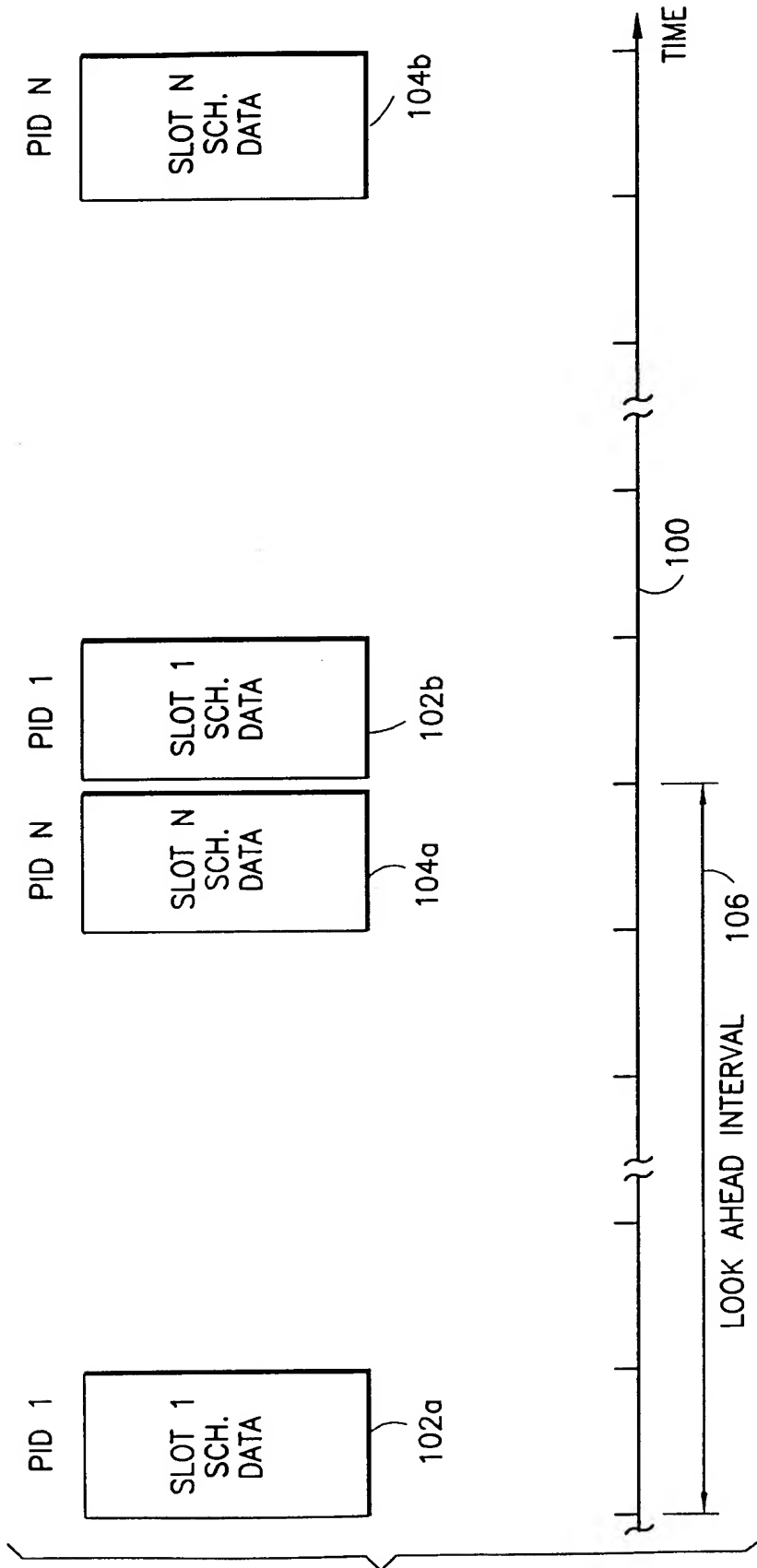


FIG. 4

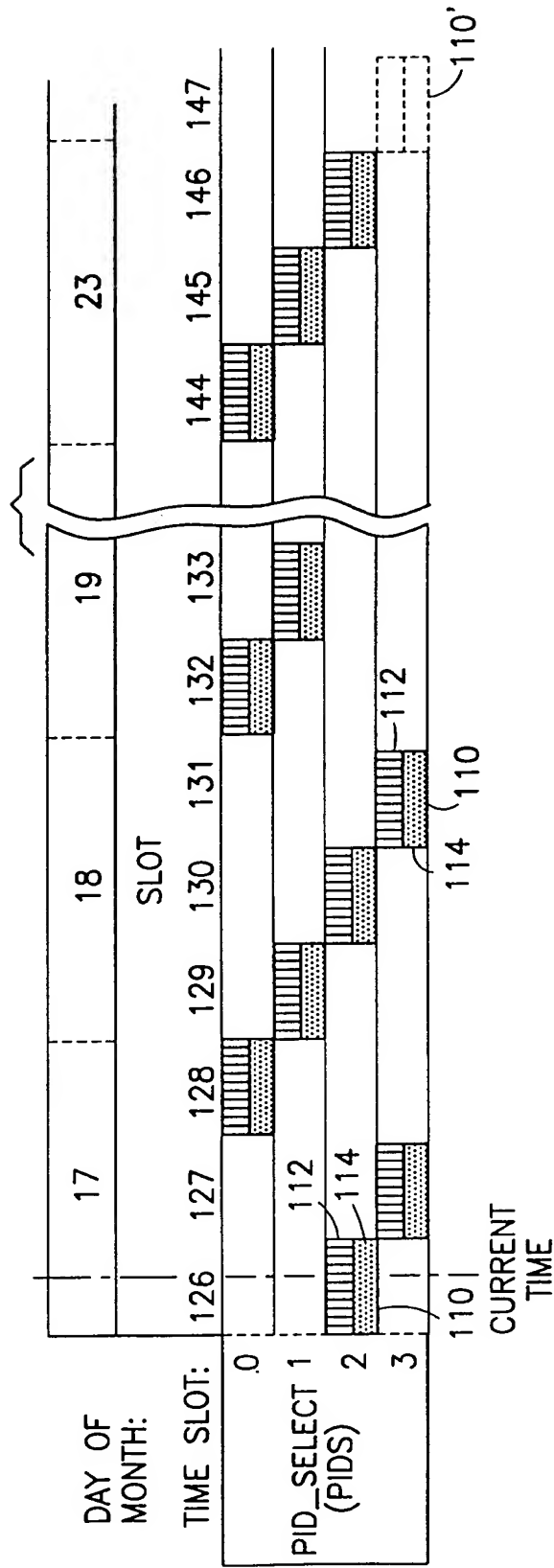


FIG. 5



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Abstract:

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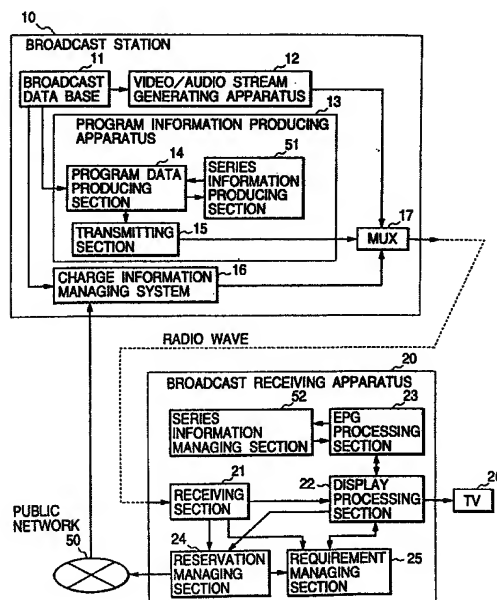
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(54) **Method and apparatus for producing program information and receiving apparatus for processing the information in a broadcast system**

(57) A program information producing apparatus (13) broadcasts program information of a next program belonging to the same program group as a subjective program in addition to the program information of the subjective program. A broadcast receiving apparatus (20) displays the program information of the next program based on the received program information of the subjective program, thereby allowing a viewer to make a reservation of the next program after checking its content during the user viewing each event of a series of programs.

FIG. 1



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## Description

### BACKGROUND OF THE INVENTION

[0001] The present invention relates to a broadcast system for broadcasting additional or supplemental program information multiplexed with main program information including video and audio data, and also related to apparatuses used in a broadcast station or a receiver apparatus using the program information. More specifically, the present invention utilizes the additional or supplemental program information to realize various types of program recording or reservation services and program table displays.

[0002] Starting a prototype digital satellite broadcast service from the year 2,000 is a goal to be attained for the broadcast industries or enterprisers in Japan. To this end, digitized broadcasting and related techniques have been steadily developed. The European standardizing organization has already decided to adopt a digital broadcast standard DVB (digital video broadcasting) that uses the MPEG2 technique for coding and/or multiplexing video and audio data. And, the digital satellite broadcast service conforming to this standard actually started from the year 1,995.

### SUMMARY OF THE INVENTION

[0003] An object of the present invention is to provide a broadcast system which transmits improved program information data and provides an improved display of the program table so as to allow users to make a reservation for a target program in various ways. Furthermore, the present invention has an object to provide improved arrangement for the apparatuses constituting this broadcast system.

[0004] In order to accomplish the above-described and other related objects, in a broadcast system of the present invention, a broadcast station produces program information including information of a next program in a series of programs, or program information of a main program and its spare program scheduled in a same time slot, or program information linking two programs, or program information designating a preferable display format of a program table, or program information including regional information. A receiving apparatus allows a sequential reservation for series programs or a reservation for a spare program, and automatically switches a program to a linked program when the view requirements are not fulfilled, and displays a characteristic program table or a local program table, and performs a bandwidth adjustment in accordance with a priority order when the broadcast station puts the priority order to each program information.

[0005] One aspect of the present invention provides a broadcast system for broadcasting a program and related program information, comprising a program information producing apparatus for broadcasting pro-

gram information of a subjective program of a program group, the program information of the subjective program including program information of other program belonging to the same program group, and a broadcast receiving apparatus for receiving the program information of the subjective program and displaying the subjective program together with the program information of other program belonging to the same program group. This arrangement allows the users to confirm the content of a program to be broadcasted next time in a series of programs.

[0006] Another aspect of the present invention provides a program information producing and transmitting method for a program information producing apparatus. This method comprises a step of producing program information of a subjective program of a program group, the program information of the subjective program including program information of other program belonging to the same program group, and a step of transmitting the subjective program and the produced program information of the subjective program. This method allows the users to confirm, the content of a program to be broadcasted next time in a series of programs.

[0007] Another aspect of the present invention provides a broadcast system for broadcasting a program and related program information, comprising a program information producing apparatus for broadcasting program information of a subjective program of a program group, the program information of the subjective program including program information of a next program to be broadcasted next time and belonging to the same program group, and a broadcast receiving apparatus for receiving the program information of the subjective program sent from the program information producing apparatus and displaying the subjective program together with the program information of the next program based on the received program information of the subjective program, thereby allowing a viewer to make a reservation of the next program. This arrangement allows the users to confirm the content of the next program to be broadcasted next time in a series of programs and also allows the users to make a reservation of the next program.

[0008] Another aspect of the present invention provides a program information producing apparatus for a broadcast system broadcasting a program and related program information. This apparatus comprises a program group information producing means for producing program information of a subjective program of a program group, the program information of the subjective program including program information of a next program to be broadcasted next time and belonging to the same program group, and a transmitting means for transmitting the subjective program and the program information produced by the program group information producing means.

[0009] Another aspect of the present invention provides a program information producing and transmitting

method for a program information producing apparatus. This method comprises a step of producing program information of a subjective program of a program group, the program information of the subjective program including program information of a next program to be  
5 broadcasted next time and belonging to the same program group, and a step of transmitting the subjective program and the produced program information of the subjective program.

**[0010]** Another aspect of the present invention provides a receiving apparatus for a broadcast system, wherein the receiving apparatus receives program information multiplexed with video and audio data, and the receiving apparatus updates the tuning processing in  
10 accordance with the received program information. With this arrangement, the tuning processing of the receiving apparatus can be undated in accordance with the received program information.

**[0011]** Another aspect of the present invention provides a receiving apparatus for a broadcast system, wherein the receiving apparatus receives program information multiplexed with video and audio data, and the receiving apparatus updates recording processing in  
15 accordance with the received program information. With this arrangement, the recording processing of the receiving apparatus can be undated in accordance with the received program information.

**[0012]** Another aspect of the present invention provides a receiving apparatus for receiving program information, comprising a program group information managing means for reading program information of a next program to be broadcasted next time from program information of a subjective program of a program group, and displaying the read program information of the next  
20 program together with the subjective program, and a reserving means for performing reservation processing in response to a user's operation for making a reservation for the next program.

**[0013]** Another aspect of the present invention provides a broadcast system for broadcasting a program and related program information, comprising a program information producing apparatus for broadcasting program information of a program of a program group, the program information including the attribute designating a recording method of a program belonging to the same  
25 program group, and a broadcast receiving apparatus for receiving the program information produced by the program information producing apparatus and performing the recording of the program in accordance with the designated recording method. For example, when a series of news programs are broadcasted, it becomes possible to record only the latest program in a substitute manner.

**[0014]** Another aspect of the present invention provides a program information producing and transmitting method for a program information producing apparatus. This method comprises a step of producing program information of a program of a program group, the pro-

gram information including designation of a recording method of a program belonging to the same program group, and a step of transmitting the produced program information including the designation of the recording method.

**[0015]** Another aspect of the present invention provides a broadcast system for broadcasting a program and related program information, comprising a program information producing apparatus for broadcasting program information of a program of a program group, the program information including the attribute designating a reservation method of a program belonging to the same program group, and a broadcast receiving apparatus for receiving the program information produced by the program information producing apparatus and performing the reservation of the program in accordance with the designated reservation method. For example, it become possible for the users to make a reservation of a sports relay broadcasting, while canceling a related sport news program broadcasting the digest of the sports events.

**[0016]** Another aspect of the present invention provides a program information producing and transmitting method for a program information producing apparatus. This method comprises a step of producing program information of a program of a program group, the program information including designation of a reservation method of a program belonging to the same program group, and a step of transmitting the produced program information including the designation of the reservation method.

**[0017]** Another aspect of the present invention provides a program information producing apparatus for a broadcast system broadcasting a program and related program information. This apparatus comprises a program group information producing means for producing program information of a program of a program group, the program information including the attribute designating a recording method of a program belonging to the same program group, and a transmitting means for transmitting the program information produced by the program group information producing means.

**[0018]** Another aspect of the present invention provides a program information producing apparatus for a broadcast system broadcasting a program and related program information. This apparatus comprises a program group information producing means for producing program information of a program of a program group, the program information including the attribute designating a reservation method of a program belonging to the same program group, and a transmitting means for transmitting the program information produced by the program group information producing means.

**[0019]** Another aspect of the present invention provides a receiving apparatus for receiving program information, comprising a reserving means for receiving program information of a program of a program group and performing reservation processing of a program in

the same program group in accordance with the attribute involved in the received program information.

[0020] Another aspect of the present invention provides a broadcast system for broadcasting a program and related program information, comprising a program information producing apparatus for broadcasting program information of a subjective program of a program group, the program information of the subjective program including information of a spare program as to whether the spare program will be broadcasted or not, and a broadcast receiving apparatus for receiving the program information of the subjective program sent from the program information producing apparatus and displaying the spare program on a program table based on the received program information, thereby allowing a viewer to make a reservation of the spare program. With this arrangement, the user can make a reservation of a program whose broadcasting is uncertain.

[0021] Another aspect of the present invention provides a program information producing apparatus for a broadcast system broadcasting a program and related program information. This apparatus comprises a spare program information producing means for producing program information including a flag indicating as to whether a spare program will be broadcasted or not, and transmitting means for transmitting the program information produced by the spare program information producing means.

[0022] Another aspect of the present invention provides a program information producing and transmitting method for a program information producing apparatus. This method comprises a step of producing program information of spare programs scheduled in a same broadcast time slot as to whether each of the space programs will be broadcasted or not, and a step of transmitting the produced program information of the spare programs.

[0023] Another aspect of the present invention provides a receiving apparatus for receiving program information, comprising a spare program managing means for producing a program table including a spare program based on program information of the spare program, and a reserving means for performing reservation processing in response to a user's operation for making a reservation of the spare program.

[0024] Another aspect of the present invention provides the receiving apparatus, wherein the reserving means is for notifying the user of failure of the reservation when the broadcasting of the spare program is canceled. With this arrangement, the user can know the failure of the reservation.

[0025] Another aspect of the present invention provides a broadcast system for broadcasting program information, comprising a program information producing apparatus for broadcasting a subjective program with viewing requirements and a related promotion program scheduled in a same time slot, and producing and broadcasting program information for each of the sub-

jective and promotion programs so as to include linking information for correlating the subjective and promotion programs, and a broadcast receiving apparatus for canceling a display of the subjective program when the viewing requirements are not fulfilled and replacing the display of the subjective program by a display of the promotion program linked to the subjective program. This system prevents the uncomfortable blackout from appearing on the TV monitor screen when a program is selected without fulfilling the viewing requirements.

[0026] Another aspect of the present invention provides the broadcast system, wherein the broadcast receiving apparatus switches the display of the promotion program to the display of the subjective program upon fulfillment of the viewing requirements. The system allows the user to check the content of the program by the promotion program before purchasing this program. The user can watch the purchased program upon completion of the necessary operation.

[0027] Another aspect of the present invention provides a program information producing apparatus for a broadcast system broadcasting program information. This apparatus comprises a link information producing means for producing program information of each of a subjective program with viewing requirements and a related promotion program scheduled in a same time slot, the program information of the subjective and promotion programs including linking information for correlating the subjective program with the related promotion program, and a transmitting means for transmitting the program information produced by the link information producing means.

[0028] Another aspect of the present invention provides a program information producing and transmitting method for a program information producing apparatus. This method comprises a step of producing program information of each of a subjective program with viewing requirements and a related promotion program scheduled in a same time slot, the program information of the subjective and promotion programs including linking information for correlating the subjective program with the related promotion program, and a step of transmitting the program information including the linking information for correlating the subjective program with the related promotion program.

[0029] Another aspect of the present invention provides a receiving apparatus for a broadcast system broadcasting program information. This apparatus comprises a requirement managing means for checking whether viewing requirements of a subjective program are fulfilled or not when a display of the subjective program is requested, a link information managing means for searching a program linked to the subjective program based on program information of the subjective program when any unfulfilled viewing requirement is confirmed by the requirement managing means, and a display control means for displaying the linked program searched by the link information managing means.

**[0030]** Another aspect of the present invention provides a broadcast system for broadcasting program information, comprising a program information producing apparatus for broadcasting program information including designation of a display format of a program table, and a broadcast receiving apparatus storing a plurality of display formats for selecting a suitable format among the plurality of display formats in accordance with the designation of the program information producing apparatus, thereby displaying the program table by using the designated display format. With this system, it becomes possible to display a characteristic or unique program table.

**[0031]** Another aspect of the present invention provides a program information producing apparatus for a broadcast system broadcasting program information. This apparatus comprises a template information producing means for producing program information including designation of a display format of a program table, and a transmitting means for transmitting the program information produced by the template information producing means.

**[0032]** Another aspect of the present invention provides a program information producing and transmitting method for a program information producing apparatus. This method comprises a step of producing program information including designation of a display format of a program table, and a step of transmitting the program information including the designation of the display format of the program table.

**[0033]** Another aspect of the present invention provides the program information producing apparatus, wherein the template information producing means is for producing a new display format and the transmitting means is for transmitting the produced new display format to a broadcast receiving apparatus. This arrangement makes it possible to add and/or modify the display format stored in the receiving apparatus.

**[0034]** Another aspect of the present invention provides a program information producing and transmitting method for a program information producing apparatus. This method comprises a step of producing a new display format, and a step of transmitting the produced new display format.

**[0035]** Another aspect of the present invention provides a receiving apparatus for a broadcast system broadcasting program information. This apparatus comprises a template information managing means storing a plurality of display formats for selecting a suitable format among the plurality of display formats in accordance with designation involved in program information, thereby producing a program table by using the designated display format.

**[0036]** Another aspect of the present invention provides a broadcast system for broadcasting program information, comprising a program information producing apparatus for broadcasting program information relating to program tables for all regions, the program

information including information indicating respective regions, and a broadcast receiving apparatus for selectively displaying a local program table corresponding to a designated region. With this arrangement, the receiving apparatus can display a local program table listing the programs receivable in this region.

**[0037]** Another aspect of the present invention provides a program information producing apparatus for a broadcast system broadcasting program information. This apparatus comprises a local program information producing means for producing program information relating to program tables for all regions, the program information including information indicating respective regions, and a transmitting means for transmitting the program information produced by the local program information producing means.

**[0038]** Another aspect of the present invention provides a program information producing and transmitting method for a program information producing apparatus. The method comprises a step of producing program information relating to program tables for all regions, the program information including information indicating respective regions, and a step of transmitting the produced program information including the program tables for all regions and the information indicating respective regions.

**[0039]** Another aspect of the present invention provides a receiving apparatus for receiving program information, comprising a local program information managing means for selecting program information corresponding to a designated region from program information of a plurality of regions, producing a local program table based on the selected program information, and displaying the produced local program table.

**[0040]** Another aspect of the present invention provides a program information producing apparatus for a broadcast system broadcasting program information. This apparatus comprises a means for putting a priority order to program information, and a means for eliminating supplemental information involved in the program information when the program information has a lower priority order, thereby performing a bandwidth adjustment. Thus, when the bandwidth adjustment is required, the supplemental information of the low-priority program is eliminated.

**[0041]** Another aspect of the present invention provides a program information producing and transmitting method for a program information producing apparatus. This method comprises a step of putting a priority order to program information, a step of eliminating supplemental information involved in the program information when the program information has a lower priority order, thereby performing a bandwidth adjustment, and a step of transmitting the bandwidth adjusted program information.

**[0042]** Another aspect of the present invention provides a program information producing apparatus for a broadcast system broadcasting program information.

The apparatus comprises a means for putting a priority order to program information, and a means for shortening a listing duration of a specific program on a program table when the specific program information has a lower priority order, thereby performing a bandwidth adjustment. Thus, when the bandwidth adjustment is required, the listing duration of the low-priority program is reduced.

[0043] Another aspect of the present invention provides a program information transmitting method for a program information producing apparatus, comprising a step of putting a priority order to program information, and a step of shortening a listing duration of a specific program on a program table when the specific program information has a lower priority order, thereby performing a bandwidth adjustment.

[0044] Another aspect of the present invention provides a program information producing apparatus for a broadcast system broadcasting program information. This apparatus comprises a means for putting a priority order to program information, and a means for changing a transmission method of the program information in accordance with the priority order.

[0045] Another aspect of the present invention provides a program information transmitting method for a program information producing apparatus. This method comprises a step of putting a priority order to program information, and a step of transmitting program information whose transmission method is changed in accordance with the priority order.

[0046] Another aspect of the present invention provides the program information transmitting method, wherein a transmitting cycle is reduced when the program information has a lower priority order, while the transmitting cycle is increased when the program information has a higher priority order. This arrangement makes it possible for the receiving apparatus to display the low-priority program information at a low frequency and display the high-priority program information at a high frequency.

[0047] Another aspect of the present invention provides a program information transmitting method for a program information producing apparatus, comprising a step of checking a priority order of program information, and a step of reducing a transmitting cycle of the program information when the program information has a lower priority order and increasing the transmitting cycle of the program information when the program information has a higher priority order.

[0048] Another aspect of the present invention provides a program information producing apparatus for a broadcast system broadcasting program information. This apparatus comprises a program information producing means for producing program information having a priority order, and a priority order processing means for changing a content or a transmission method of the program information in accordance with the priority order of the program information.

[0049] Another aspect of the present invention pro-

vides a program information transmitting method for a program information producing apparatus. This method comprises a step of putting a priority order to program information, and a step of transmitting the program information whose content or transmission method is changed in accordance with the priority order of the program information.

## BRIEF DESCRIPTION OF THE DRAWINGS

[0050] The above and other objects, features and advantages of the present invention will become more apparent from the following detailed description which is to be read in conjunction with the accompanying drawings, in which:

Fig. 1 is a block diagram schematically showing an arrangement of a broadcast system in accordance with a first embodiment of the present invention;

Fig. 2 is a view showing an event information table used in the broadcast system in accordance with the first embodiment of the present invention;

Fig. 3 is a view showing another event information tables used in the broadcast system in accordance with the first embodiment of the present invention;

Fig. 4 is a block diagram schematically showing an arrangement of a broadcast system in accordance with a second embodiment of the present invention;

Fig. 5 is a view showing an event information table used in the broadcast system in accordance with the second embodiment of the present invention;

Fig. 6 is a view showing the event information tables whose schedule is modified in accordance with the second embodiment of the present invention;

Fig. 7 is a view showing a program table used for displaying spare programs in the broadcast system in accordance with the second embodiment of the present invention;

Fig. 8 is a view showing the program table whose schedule is modified in accordance with the second embodiment of the present invention;

Fig. 9 is a screen display indicating the cancellation of a scheduled broadcasting used in the broadcast system in accordance with the second embodiment of the present invention;

Fig. 10 is a block diagram schematically showing an arrangement of a broadcast system in accordance with a third embodiment of the present invention;

Fig. 11 is a view showing event information tables used in the broadcast system in accordance with the third embodiment of the present invention;

Fig. 12 is a view illustrating a switching operation of the viewing channel performed in the broadcast system in accordance with the third embodiment of the present invention;

Fig. 13 is a block diagram schematically showing an arrangement of a broadcast system in accordance with a fourth embodiment of the present invention;

Fig. 14 is a view showing a service information table used in the broadcast system in accordance with the fourth embodiment of the present invention;

Fig. 15 is a view showing program tables used in the broadcast system in accordance with the fourth embodiment of the present invention;

Fig. 16 is a block diagram schematically showing an arrangement of a broadcast system in accordance with a fifth embodiment of the present invention;

Fig. 17 is a view showing a service information table used in the broadcast system in accordance with the fifth embodiment of the present invention;

Fig. 18 is a view showing a program table used in the broadcast system in accordance with the fifth embodiment of the present invention;

Fig. 19 is a block diagram schematically showing an arrangement of a broadcast system in accordance with a sixth embodiment of the present invention;

Fig. 20 is a view showing a screen used in the priority order changing procedure performed in the broadcast system in accordance with the sixth embodiment of the present invention;

Fig. 21 is a view illustrating the modification of an event information table performed based on the priority in the broadcast system in accordance with the sixth embodiment of the present invention;

Fig. 22 is a view illustrating the modification of a cycle setting table performed based on the priority in the broadcast system in accordance with the sixth embodiment of the present invention;

Fig. 23 is a block diagram schematically showing an arrangement of a priority order changing mechanism adopted in the broadcast system in accordance with the sixth embodiment of the present invention;

Fig. 24 is a block diagram schematically showing a fundamental arrangement of a broadcast system; and

Fig. 25 is a block diagram schematically showing a hardware arrangement of a receiving apparatus of the broadcast system shown in Fig. 24.

#### DESCRIPTION OF THE PREFERRED EMBODIMENTS

**[0051]** Preferable embodiments of the present invention will be explained in detail with reference to attached drawings.

#### *Digital Satellite Broadcast System*

**[0052]** Fig. 24 shows a fundamental arrangement of a digital satellite broadcast system. In a broadcast station 10, a broadcast data base 11 stores main program information and program scheduling information. A video/audio stream generating apparatus 12 generates a data stream of the main program information. A pro-

gram information producing apparatus 13 produces program information. A charge information managing system 16 manages charge information relating to the viewing of programs. A multiplexing apparatus (MUX) 17 transmits a transport stream (TS) of multiplexed data including the data stream of the main program information, the program information produced by the program information producing apparatus 13, and the charge information. In the program information producing apparatus 13, a program data producing section 14 produces program information based on the program scheduling information obtained from the broadcast data base 11. A transmitting section 15 repetitively transmits the program information produced by the program data producing section 14.

**[0053]** In a broadcast receiving apparatus 20, a receiving section 21 receives a TS signal sent from the broadcast station 10 and demodulates the received TS signal. A display processing section 22 decodes the video and audio data and the program information involved in the received TS signal. An EPG (electronic program guide) processing section 23 produces a program table to be displayed based on the decoded program information. A reservation managing section 24 manages the display or recording of a reserved program in response to a user's operation and transmits the information relating to all of purchased PPV (pay per view) programs via a public network 50 to the charge information managing system 16 in the broadcast station 10. A requirement managing section 25 checks whether the viewing requirements of a program are fulfilled or not when the viewing of this program is requested. A display section (TV) 26 displays the video with the sounds.

**[0054]** Fig. 25 is a schematic view showing a hardware arrangement of the broadcast receiving apparatus 20. A tuner 72 tunes in to the signal received by an antenna. A demodulating circuit 73 demodulates the tuned signal. The tuner 72, the demodulating circuit 73, a CPU 76, and a memory 78 cooperatively function as the receiving section 21 shown in Fig. 24. A demultiplexer 74 separates the demodulated signal into video and audio data and program information data. An AV decoder 75 decodes the video and audio data. A section decoder 77 decodes the program information data. A light receiving section 79 receives a command sent from a remote controller 82. The demultiplexer 74, the AV decoder 75, the section decoder 77, the light receiving section 79, the CPU 76 and the memory 78 cooperatively function as the display processing section 22 shown in Fig. 24. The CPU 76 and the memory 78 cooperatively function as the EPG processing section 23. An IC card 80 memorizes the data relating to purchased programs. A modem 81 performs data communication via the public network 50. The IC card 80, the modem 81, the CPU 76 and the memory 78 cooperatively function as the requirement managing section 25 shown in Fig. 24.



[0055] According to the above-described broadcast station 10, the program data producing section 14 of the program information producing apparatus 13 produces the program information data based on the program scheduling information obtained from the broadcast data base 11 and sends the produced program information data to the transmitting section 15. The produced program information data may contain network (i.e., an assembly of a plurality of transponders) related information including the tuning to the TS signal, service (i.e., channel) related information including service ID, service name, service type etc., and event (i.e., program) related information including program ID, program name, program start time, program length, etc. The transmitting section 15 divides the program information data into MPEG2 TS packets which are multiplexable in the MUX 17. The MPEG2 TS packets are repetitively transmitted from the transmitting section 15 to the MUX 17.

[0056] The MUX 17 multiplexes the program information data sent from the transmitting section 15 with the data stream of the main program information produced from the video/audio stream generating apparatus 12 and the charge information sent from the charge information managing system 16, thereby producing a multiplexed TS signal which is broadcasted via a transponder.

[0057] The program information including the same content is repetitively broadcasted. A version number is allocated to each transmitting unit of the program information. The version number is incremented upon updating the contents of the program information. The broadcast receiving apparatus 20 receives the broadcasted program information, and stores the latest program information in the memory with reference to its version number. To this end, the broadcast receiving apparatus 20 always monitors the program information to update the stored data in response to the increment of the version number, or acquires the program information only when it is needed, or receives the program information periodically (e.g., once a day).

[0058] The broadcasting radio wave including the program information is demodulated in the receiving section 21, and decoded in the display processing section 22. Referring to the version number, the display processing section 22 stores the latest program information.

[0059] The EPG processing section 23 accesses network information involved in the program information stored in the memory to obtain a list of service numbers of all services (channels) available through the network. Then, the EPG processing section 23 obtains the service related information, such as service ID and service name, and the event related information, such as program schedule, from the program information.

[0060] The program table is processed in the display processing section 22 in accordance with the user's request and is displayed on the TV monitor 26.

[0061] When the user selects a program from the program table displayed on the screen of TV monitor 26 to make a reservation of viewing and/or recoding, the reservation is notified to the reservation managing section 24 through the display processing section 22. The reservation managing section 24 manages the program ID and the reservation time to start the display and/or recording of the reserved program when the reservation time comes, and also notifies the requirement managing section 25 of the completion of reservation procedure. Furthermore, when any PPV program is reserved, the reservation managing section 24 memorizes the purchased PPV program and sends the related charge information to the charge information managing system 16 in the broadcast station 10 via the public network 50.

[0062] The requirement managing section 25 checks whether the viewing requirements of the reserved program are fulfilled or not. More specifically, when the viewing of this program is requested, the requirement managing section 25 compares the viewing conditions, such as age requirement and price requirement (charged/free), with the user's age registered in the broadcast receiving apparatus 20 and the reserved contents notified from the reservation managing section 24. Thus, the viewing of the reserved program is allowed only when all of the viewing conditions are fulfilled.

[0063] Furthermore, when the viewer selects a channel (i.e., designates a service number) to watch a program currently on air, the receiving section 21 accesses the network information involved in the program information stored in the memory to obtain both TS-ID relating to the selected channel and tuning information for the designated TS. Then, the receiving section 21 tunes in to the designated TS and collects the packets of the selected channel to produce a demodulation signal of the selected channel. When all of the viewing requirements are fulfilled, the display processing section 22 decodes the video and audio signals from the demodulation signal. The decoded video is displayed with sounds through the TV monitor 26.

[0064] When the broadcast receiving apparatus 20 has no rights to receive a certain PPV program, a scrambled meaningless video (referred to "blackout") appears on the screen in response to the receiving of this PPV program. At the same time, a message recommending to purchase this PPV program and a price for viewing it are displayed on the screen. If the user operates an input apparatus to purchase this PPV, the scramble guard is removed and the video is clearly displayed on the screen. The purchase data is memorized in the reservation managing section 24. The collected purchase data is sent to the charge information managing system 16 in the broadcast station 10 via the public network 50.

[0065] However, the above-described broadcast system has the following matters to be improved.

[0066] According to this broadcast system, when a user makes a reservation of a series of programs, such

as drama series, the user needs to make a reservation of all of the series programs collectively. It is impossible to make a reservation of the programs one by one after checking the content of each program broadcasted next time.

**[0067]** Furthermore, it is impossible to make a reservation for viewing and/or recording a program whose broadcasting depends on uncertain conditions, such as weather. For example, a spare program for a sports program will be broadcasted only when this sports event is canceled due to bad weather.

**[0068]** The PPV programs usually provide a preview service for allowing users to watch this program for a few minutes on a free basis. Thus, the users can confirm the content of each PPV program through this preview service before purchasing this PPV program. However, the preview service is not satisfactory to check the program content sufficiently. Furthermore, the blackout suddenly appears on the TV monitor screen upon initiation of the PPV program not purchased. This is uncomfortable for the viewers.

**[0069]** Usually, only one type of program table is displayed. Thus, similar format is used to display the program data of each channel, lacking in variety. It takes a long time to search a target program among numerous programs.

#### *First Embodiment*

**[0070]** A first embodiment of the present invention provides a broadcast system allowing users to make a reservation for a series of programs in various ways. In this embodiment, a series of programs include a program group of non-related programs as well as a program group of related programs, such as series drama, animation stories, everyday or periodical news, movies etc, which are scheduled in a predetermined time slot or classified into the same category.

**[0071]** In a broadcast station of this system shown in Fig. 1, a broadcast data base 11 stores main program information and program scheduling information. A video/audio stream generating apparatus 12 generates a data stream of the main program information. A program information producing apparatus 13 produces program information. A charge information managing system 16 manages charge information relating to the viewing of programs. A multiplexing apparatus (MUX) 17 transmits a transport stream (TS) of multiplexed data including the data stream of the main program information, the program information produced by the program information producing apparatus 13, and the charge information. In the program information producing apparatus 13, a program data producing section 14 produces program information based on the program scheduling information obtained from the broadcast data base 11. A series information producing section 51, connected to the program data producing section 14, produces program information of a series of programs. A transmitting

section 15 repetitively transmits the program information produced by the program data producing section 14.

**[0072]** In a broadcast receiving apparatus 20, a receiving section 21 receives a TS signal sent from the broadcast station 10 and demodulates the received TS signal. A display processing section 22 decodes the video and audio data and the program information involved in the received TS signal. An EPG processing section 23 produces a program table based on the decoded program information. A series information managing section 52 manages the display of advance notice for a series of programs (i.e., program group). A reservation managing section 24 manages the display or recording of a reserved program in response to a user's operation and transmits the information relating to all of purchased PPV (pay per view) programs via a public network 50 to the charge information managing system 16 in the broadcast station 10. A requirement managing section 25 checks whether the viewing requirements of a program are fulfilled or not when the viewing of this program is requested. A display section (TV monitor) 26 displays the video with the sounds.

**[0073]** The broadcast receiving apparatus 20 has a hardware arrangement substantially identical with that shown in Fig. 25. Like the EPG processing section 23, the CPU 76 and the memory 78 cooperatively function as the series information managing section 52. In other words, the operation of the series information managing section 52 is part of the operation performed by the EPG processing section 23.

**[0074]** The above-described broadcast station 10 and the broadcast receiving apparatus 20 performs the following operation relating to a series of programs in addition to the operation of the above-described fundamental broadcast system.

**[0075]** Fig. 2 shows an event information table of a series of programs produced by the series information producing section 51 of the program information producing apparatus 13 based on the program scheduling information obtained from the broadcast data base 11 in the broadcast station 10.

**[0076]** This event information table, relating to an event 11 being one of a series of programs, contains the data inherent to this event 11, such as program name (program 11) and series ID. Furthermore, this event information table includes the data, such as "program name", "broadcast start time", "broadcast end time", "reservation number" etc. of another event 12 which is the next program of this series.

**[0077]** The transmitting section 15 sends this event information table to the MUX 17. After being multiplexed in the MUX 17, the event information table is transmitted in the form of a TS signal to the broadcast receiving apparatus 20.

**[0078]** The TS signal including the event information table is demodulated in the receiving section 21 and decoded in the display processing section 22. The

decoded program information is stored in the memory.

**[0079]** A viewer of the broadcast receiving apparatus 20, watching the event 11, may operate a remote controller to request the notice of the next program belonging the same series. In response to this request, the series information managing section 52 reads the event information table of Fig. 2 from the memory storing the program information relating to the event 11. Then, the information of the next event 12, including the program name, the broadcast start/end time, the content etc., is displayed on the TV monitor 26 to allow the viewer to make a reservation of the next program.

**[0080]** To provide an automatic reservation guide, it is preferable to display a mouse selectable menu by using GUI (graphical user interface) several minutes before the termination of the currently broadcasted program. It is also preferable that the broadcast station 10 transmits a "reservation guide" button through the data transmission in synchronism with the main program of event 11. The user can operate the displayed button to display the reservation guide GUI.

**[0081]** Upon completion of the input procedure for reservation done by the user based on the notice of the next program, the reservation result is sent through the display processing section 22 to the reservation managing section 24. The reservation managing section 24 performs the reservation processing for the event 12 based on the event ID, the start/end time, and reservation number.

**[0082]** As described above, this system allows the user to make a reservation for the next program of the same series after checking the content of the next program each time when the user watches the present program currently on air.

**[0083]** Furthermore, this embodiment can be modified in various manners. For example, it is possible to display the content of the previous program or a plurality of programs in the same series in addition to the content of the next program.

**[0084]** For example, the program information producing apparatus can add the summary of past stories in this series to the program information of the present program transmitted to the broadcast receiving apparatus. The broadcast receiving apparatus can display the summary of the past stories each time a program of this series is broadcasted. Furthermore, when a plurality of sports events constitute a series of programs, it is possible to advertize a major sports event by adding its information to each program of this series, increasing chances for encouraging users to make a reservation for it.

**[0085]** Fig. 3 shows another event information tables of a series of programs produced by the series information producing section 51 of the program information producing apparatus 13 based on the program scheduling information obtained from the broadcast data base 11 in the broadcast station 10. These event information tables include series attributes relating to automatic pro-

gram tuning (i.e., automatic power-on and turning on time) and automatic recording controls. More specifically, attribute 1 represents an automatic recording for recording a program on a previously recorded program of the same series in a substitute manner. Attribute 2 represents an automatic recording for recording a program independent of the previously recorded program. Attribute 3 represents an automatic tuning with no recording.

**[0086]** The broadcast station 10 defines a series of news programs which are to be broadcasted everyday. The event information table of each news program includes the attribute 1, as shown in the event information tables of events 11, 12 and 13 of Fig. 3. The series information producing section 51 describes the series attribute 1 together with the program name and the series ID in each event information table based on the program scheduling information obtained from the broadcast data base 11.

**[0087]** Furthermore, the series information producing section 51 describes the series attribute 2 together with the program name and the series ID in the event information table of an event when this event relates to a series of drama programs.

**[0088]** Furthermore, it may be possible to define a sports relay broadcasting and a sports news as constituents of a series of sports programs. A user may want to record the sports relay broadcasting and deny the recording of the sports news to be broadcasted after this sports event. In this case, with reference to the program scheduling information obtained from the broadcast data base 11, the series information producing section 51 describes the attribute 2 in the event information table of the sports relay broadcasting as shown in the event information tables of events 21 and 22 of Fig. 3, and describes the attribute 3 in the event information table of the sports news as shown in the event information table of event 23 of Fig. 3.

**[0089]** The broadcast receiving apparatus 20 expands the received program information in the memory, and displays the program information on the screen of TV monitor 26 in response to a user's operation or request. The reservation data entered by the user is entered to the reservation managing section 24. Then, the reservation managing section 24 performs the reservation processing of the designated program in accordance with the attribute of this program.

**[0090]** As a result, it becomes possible to store the latest news program only. Furthermore, it becomes possible to record all of drama programs belonging to the same series. It is also possible to record a sports relay broadcasting and deny the recording of the sports news to be broadcasted after this sports event.

**[0091]** According to the above-described embodiment, the program information is transmitted from the broadcast station to the receiving apparatus via a broadcasting satellite. However, the transmission of the program information to the receiving apparatus can be

attained by using other methods. For example, it is possible to use another network to transmit the program information. The conventionally available recoding media, such as FD and DVD, can be used to transmit or store the program information.

[0092] As described above, this broadcast system makes it possible to make a reservation of a series of programs in various ways by changing the data format of the program information.

#### *Second Embodiment*

[0093] A second embodiment of the present invention provides a broadcast system allowing users to make a reservation for a spare program scheduled in the same time slot as a main program but whose broadcasting depends on uncertain factor such as weather. For example, a spare program for a sports program will be broadcasted only when this sports event is canceled due to bad weather.

[0094] Fig. 4 shows a broadcast system of the second embodiment. In the broadcast station 10, the program information producing apparatus 13 includes a spare program producing section 53 which produces program information of a spare program, or program information of a main program related to this spare program. The broadcast receiving apparatus 20 includes a spare program managing section 54 which displays a program table including the spare program and the main program. The second embodiment differs from the above-described first embodiment in that the series information producing section 51 and the series information managing section 52 shown in Fig. 1 are replaced by the spare program producing section 53 and the spare program managing section 54. The rest of the second embodiment is substantially the same as the arrangement of the first embodiment.

[0095] Fig. 5 shows an event information table of a main program (event 1) and event information tables of related spare programs (events 2 and 3) produced by the spare program producing section 53 of the program information producing apparatus 13 based on the program scheduling information obtained from the broadcast data base 11 in the broadcast station 10.

[0096] Each event information table includes a broadcast flag and a spare flag in addition to a program name. The broadcast flag indicates as to whether this program will be actually broadcasted or not. The spare flag indicates as to whether this program has a spare program or whether this program is the spare program itself. A spare event ID is included to identify the spare program when any spare program is included.

[0097] The broadcast flag is "1" when the program will be surely broadcasted. As shown in Fig. 5, when no change is expected in the broadcast schedule, the broadcast flag "1" is allocated to the main program (event 1) and the broadcast flag "0" is allocated to the spare programs (event 2 and event 3). The spare flag

"1" is allocated to the main program having any spare program, while the spare flag "2" is allocated to the spare programs. The spare flag "0" is allocated to the main program having no spare program. The event information table of the main program (event 1) having a spare flag "1" includes a spare event ID identifying the spare program.

[0098] The broadcast receiving apparatus 20 expands the received program information in the memory. The spare program managing section 54 produces a program table listing ordinary programs, main programs and related spare programs. The spare program managing section 54 displays a program table including information obtained from the event information table for an ordinary program when this ordinary program has a spare flag "0." When the main program (event 1) has a spare flag 1 and a broadcast flag "1", the spare program managing section 54 refers to the event information tables of the spare programs (event 2 and event 3) based on the spare event list. When each spare program has a broadcast flag "0", the spare program managing section 54 displays a program table including the event 1 as a main program and the events 2 and 3 as spare programs.

[0099] Fig. 7 shows an example of a program table displayed on the screen of TV monitor 26 based on the event information tables shown in Fig. 5.

[0100] In this manner, including spare programs on the displayed program table allows the user to make a reservation for a listed favorable spare program. In this case, it is possible to perform the reservation procedure for both of the main and spare programs scheduled in the same time slot. The result of the reservation procedure done by the user is notified to the reservation managing section 24.

[0101] If the events 2 and 3 are actually broadcasted due to cancellation of the broadcasting of the event 1, the spare program producing section 53 of the broadcast station 10 obtains the changed program scheduling information from the broadcast data base 11 and produces an event information table of the event 1 having a broadcast flag "0" and event information tables of the events 2 and 3 having a broadcast flag "1" as shown in Fig. 6.

[0102] The spare program managing section 54 of the broadcast receiving apparatus 20 receives these event information tables. When the event 1 (main program) has a broadcast flag "0", the spare program managing section 54 refers to the event information tables of the spare programs (event 2 and event 3) based on the spare event list. When each spare program has a broadcast flag "1", the spare program managing section 54 displays a program table including the events 2 and 3 only without listing the main program.

[0103] Fig. 8 shows a program table displayed on the screen of TV monitor 26 based on the event information tables shown in Fig. 6.

[0104] It is also preferable that the spare program

managing section 54 describes only the event information tables of the events 2 and 3 when the broadcasting of the event 1 is canceled, describing no event information table relating to the event 1. In this case, the user can know the cancellation of the event 1 by comparing the new and old event information tables.

**[0105]** According to the example of this embodiment, there is a case where only the event 2 has a broadcast flag "1" and other events 1 and 3 have a broadcast flag "0." In such a case, no program will be broadcasted in the time slot from 20:00 to 21:00.

**[0106]** When the start time of a reserved program comes, the reservation managing section 24 refers to the event information table of the reserved program, and displays the reserved program as scheduled when its broadcast flag is 1. If the broadcast flag is "0" in the event information table of the reserved program, the display processing section 22 displays a message notifying the user of the cancellation of the reserved program, as shown in Fig. 9.

**[0107]** According to the above-described embodiment, the program information is transmitted from the broadcast station to the receiving apparatus via a broadcasting satellite. However, the transmission of the program information to the receiving apparatus can be attained by using other methods. For example, it is possible to use another network to transmit the program information. The conventionally available recoding media, such as FD and DVD, can be used to transmit or store the program information.

**[0108]** As described above, this broadcast system makes it possible to make a reservation of a spare program whose broadcasting is uncertain by changing the data format of the program information.

**[0109]** According to this embodiment, the spare programs are scheduled in the same time slot as the main program. However, there is a possibility that a spare program may be scheduled in a different time slot. Furthermore, the program table of Fig. 7 lists both the main program and the spare programs simultaneously. According to this embodiment, a similar program table will be used even when the main and spare programs are scheduled in different time slots.

### *Third Embodiment*

**[0110]** A third embodiment of the present invention provides a broadcast system encouraging users to make a reservation for a PPV program by using a promotion program linked to the PPV program when this PPV program is on air.

**[0111]** Fig. 10 shows a broadcast system of the third embodiment. In the broadcast station 10, the program information producing apparatus 13 includes a link information producing section 57 which produces program information relating to a subjective program and a linked program. The broadcast receiving apparatus 20 includes a link information managing section 58 which

manages the link information correlating the subjective program with the linked program. The third embodiment differs from the above-described first embodiment in that the series information producing section 51 and the series information managing section 52 shown in Fig. 1 are replaced by the link information producing section 57 and the link information managing section 58. The rest of the third embodiment is substantially the same as the arrangement of the first embodiment.

**[0112]** According to this broadcast system, a PPV channel broadcasts a PPV program while a promotion channel broadcasts a promotion program introducing this PPV program. When the broadcast receiving apparatus 20 has no rights to receive this PPV program, the broadcast receiving apparatus 20 automatically tunes in to the promotion channel upon receiving the PPV program. When a purchasing procedure of this PPV program is done by the user who took a look at this promotion channel, the broadcast receiving apparatus 20 starts the display of the purchased PPV program.

**[0113]** Fig. 11 shows event information tables of a main program (event 11) and a event information table of its promotion program (event 111) produced by the link information producing section 57 of the program information producing apparatus 13 based on the program scheduling information obtained from the broadcast data base 11 in the broadcast station 10.

**[0114]** The event information table of the main program (event 11) describes a service ID (1) and an event ID (111) indicating the linked promotion program as well as the viewing requirements of the main program. The event information table of the promotion program (event 111) describes a service ID (2) and an event ID (11) indicating the linked main program.

**[0115]** The viewing requirements include an "age limit" item designating an allowable lower age of a viewer, a "PPV flag" representing a charged (1) or free (0) view, a contract type designating a one-month limit contract (2) in service unit, a contract (3) in program unit or the like, and a "price" item representing a price for each contract type.

**[0116]** The transmitting section 15 sends these event information tables to the MUX 17. After being multiplexed in the MUX 17, these event information tables are transmitted in the form of a TS signal to the broadcast apparatus 20.

**[0117]** The TS signal including these event information tables is demodulated in the receiving section 21 and decoded in the display processing section 22. The decoded event information tables are stored in the memory.

**[0118]** The broadcast receiving apparatus 20 performs a switching operation between linked channels based on the information contained in the received event information tables. Fig. 12 illustrates the details of the channel switching procedure performed in accordance with the order of encircled numbers.

**[0119]** In the broadcast receiving apparatus 20, after

completion of one program, it is now assumed that a new program (event 11) is started at a timing ①. In response to this program change, the requirement managing section 25 obtains the viewing requirements described on the event information table of the event 11 via the EPG processing section 23, and compares the obtained viewing conditions of the event 11 with the registered viewer's data, such as age, reservation conditions, contract contents, etc. at a timing ②. When all of the viewing conditions are fulfilled, the viewing of the event 11 is allowed.

[0120] On the other hand, when the viewing conditions are not fulfilled due to incompleteness of the purchasing procedure for this event 11, the requirement managing section 25 notifies the display processing section 22 of nonfulfillment of the viewing conditions. The display processing section 22 obtains the event ID (event 111) and the service ID (1) of the linked program via the link information managing section 58 which refers to the event information table of the event 11. Then, based on the obtained data, the display processing section 22 displays an event 111, i.e., a promotion program of the event 11, on the TV monitor 26 at a timing ③.

[0121] A user, watching this promotion program, performs a purchasing procedure for this event 11 at a timing ④. The display processing section 22 sends the result of the purchasing procedure to the reservation managing section 24. The reservation managing section 24 notifies the purchase acknowledgment to the requirement managing section 25 and the charge information managing system 16 of the broadcast station 10. The requirement managing section 25 notifies the display section 22 of fulfillment of the viewing conditions of the event 11. The display section 22 obtains the event ID (event 11) and the service ID (2) of the linked program, via the link information managing section 58 which refers to the event information table of the event 111. Then, based on the obtained data, the display processing section 22 starts displaying the event 11 on the TV monitor 26 at a timing ⑤.

[0122] According to the above-described embodiment, the program information is transmitted from the broadcast station to the receiving apparatus via a broadcasting satellite. However, the transmission of the program information to the receiving apparatus can be attained by using other methods. For example, it is possible to use another network to transmit the program information. The conventionally available recording media, such as FD and DVD, can be used to transmit or store the program information.

[0123] As apparent from the foregoing description, this broadcast system prevents the uncomfortable blackout from appearing on the TV monitor screen when a PPV program is selected without fulfilling the viewing requirements. Instead, a promotion program introducing this PPV program is displayed. The broadcasting of this promotion program provides users a suf-

ficient time to check the content of this PPV program before deciding to purchase it or not. During this procedure, the users can enjoy a continuous display from the promotion program to the PPV program.

#### *Fourth Embodiment*

[0124] A fourth embodiment of the present invention provides a broadcast system realizing a unique display for a program table.

[0125] Fig. 13 shows a broadcast system of the fourth embodiment. In the broadcast station 10, the program information producing apparatus 13 includes a template information producing section 55 which designates a preferable template used in the display of a program table in each channel. The broadcast receiving apparatus 20 includes a template information managing section 56 which manages templates used in the display of the program table. The fourth embodiment differs from the above-described first embodiment in that the series information producing section 51 and the series information managing section 52 shown in Fig. 1 are replaced by the template information producing section 55 and the template information managing section 56. The rest of the fourth embodiment is substantially the same as the arrangement of the first embodiment.

[0126] In the broadcast station 10, the template information producing section 55 occasionally produces a template table describing a template used in the display of the program table. The produced template table is transmitted to the broadcast receiving apparatus 20. In the broadcast receiving apparatus 20, the template information managing section 56 stores each of the received templates or replaces an old template by a newly sent template according to the instruction involved in the template table. Thus, the template information managing section 56 stores a plurality of templates. The template may be a display soft or a setting file which describes a format peculiar to the display soft.

[0127] Fig. 14 shows a service information table including a service ID identifying a service, produced by the template information producing section 55 of the broadcast station 10. This service information table is transmitted together with the program information to the broadcast receiving apparatus 20.

[0128] In the broadcast receiving apparatus 20, the EPG processing section 23 obtains the template ID of the service from the service information table, reads a template corresponding to this template ID from the template information managing section 56, and displays various program information (channel name, detailed information, performers etc.) of this service by using the template.

[0129] Fig. 15 shows two program tables which are differentiated from each other, wherein table (a) shows a program table used for a news channel, while table (b) shows a program table used for a music channel.

[0130] For example, it is preferable that the program

table of the news channel has a calm color tone to display momentary news while the program table of the music channel has a colorful color tone and emphasizes users' concerning information, such as singers' names.

[0131] Regarding the templates stored in the template information managing section 56, it is possible to set a predetermined number of templates beforehand when the broadcast receiving apparatus 20 is shipped. In the broadcast section, it is preferable that the template information producing section 55 produces a template only when the present template needs to be changed or a new template is required and transmits the produced template to the broadcast receiving apparatus 20.

[0132] It is also possible to change the templates according to the preference of each enterpriser. If an enterpriser "A" has a plurality of services, it will be preferable to use a common template for each of these services to transmit a unified video of the enterpriser "A", thereby giving impression to viewers.

[0133] According to the above-described embodiment, the program information is transmitted from the broadcast station to the receiving apparatus via a broadcasting satellite. However, the transmission of the program information to the receiving apparatus can be attained by using other methods. For example, it is possible to use another network to transmit the program information. The conventionally available recoding media, such as FD and DVD, can be used to transmit or store the program information.

[0134] As apparent from the foregoing description, this broadcast system realizes the characteristic display of a program table differentiated for each program. According to this broadcast system, the broadcast receiving apparatus has a plurality of templates beforehand. The broadcast station transmits only the selection data for designating a preferable template, realizing an improved transmitting efficiency.

#### *Fifth Embodiment*

[0135] A fifth embodiment of the present invention provides a broadcast system wherein program information of all of terrestrial broadcasting services in addition to the program information of satellite broadcasting services and each receiving apparatus is allowed to selectively display necessary program tables.

[0136] Fig. 16 shows a broadcast system of the fifth embodiment. In the broadcast station 10, the program information producing apparatus 13 includes an other network information producing section 59 which produces program information of other network. The broadcast receiving apparatus 20 includes an other network information managing section 60 which manages the display of program information of other network. The fifth embodiment differs from the above-described first embodiment in that the series information producing section 51 and the series information managing section 52 shown in Fig. 1 are replaced by the other network

information producing section 59 and the other network information managing section 60. The rest of the fifth embodiment is substantially the same as the arrangement of the first embodiment.

[0137] In the broadcast station 10, the other network information producing section 59 produces program information of terrestrial broadcasting services in addition to the program information of the satellite broadcasting services produced by the program data producing section 14. Fig. 17 shows service information tables produced by the program data producing section 14 and the other network information producing section 59. Each service information table includes a network ID representing a network, a service ID identifying a service, a service name, and a region ID indicating a broadcast service area. The network ID is 1 for the BS network and 2 for the terrestrial network. A different region ID is assigned to each prefecture. The other network information producing section 59 produces service information tables covering terrestrial broadcasting services of all regions. Each service information table includes the corresponding region ID.

[0138] These service information tables are broadcasted from the broadcast station 10 and received by the broadcast apparatus 20.

[0139] The broadcast receiving section 20 expands the received service information table in the memory. The EPG processing section 23 performs the processing for listing all of service information having the same network ID 1. Thus, a program table for the satellite broadcasting services is displayed on the TV monitor screen through the display processing section 22.

[0140] When the service information has a network ID other than 1, the other network information managing section 60 compares the region ID included in its service information table with the region information registered in the receiving apparatus (being set by a user through a setting screen of the receiving apparatus). If the region ID agrees with the registered region information, the other network information managing section 60 performs the processing for listing this service information on the program table. The program table including the listed service information is displayed on the TV monitor screen through the display processing section 22. If the region ID disagrees with the registered region information, no information relating to this service information is listed on the program table.

[0141] Fig. 18 shows an example of a composite display simultaneously showing a program table listing BS channels and a program table listing local terrestrial TV channels.

[0142] According to the above-described embodiment, the program information is transmitted from the broadcast station to the receiving apparatus via a broadcasting satellite. However, the transmission of the program information to the receiving apparatus can be attained by using other methods. For example, it is possible to use another network to transmit the program



information. The conventionally available recoding media, such as FD and DVD, can be used to transmit or store the program information.

**[0143]** As apparent from the foregoing description, this broadcast system makes it possible to display a program table listing local terrestrial TV channels in addition to the BS channels.

#### *Sixth Embodiment*

**[0144]** A sixth embodiment of the present invention provides a broadcast system wherein a priority order is put to each program information so as to adjust a transmission data amount or change the display frequency at the receiving apparatus in accordance with the priority order.

**[0145]** Fig. 19 shows a broadcast system of the sixth embodiment. In the broadcast station 10, the program information producing apparatus 13 includes a priority processing section 61 which changes the processing of the program information in accordance with the priority order allocated to the program information.

**[0146]** In the broadcast station 10, the program data producing section 14 produces an event information table of each event based on the program scheduling information obtained from the broadcast data base 11, as shown in (a) of Fig. 21. Each event information table describes a priority order of this program information in addition to service ID, event ID, start/end time, program content, and performers' names. The priority order is classified into three grades from 1 to 3. A default value for the priority order is set to 2, although an operator of the broadcast station 10 can manipulate a terminal to change the default value.

**[0147]** For example, in the broadcast station 10, the operator manipulates a terminal 62 to read the table information from the program data producing section 14 as shown in Fig. 23. Based on the readout table information, a service table is displayed on the screen of the terminal 62 (refer to (a) of Fig. 20). Next, the operator selects a preferable service from the displayed table to display the programs of the selected service (refer to (b) of Fig. 20). Then, the operator selects a program having a priority order to be changed. Upon operator's selection, the program information of the selected program is displayed on the terminal screen (refer to (c) of Fig. 70). The operator rewrites the priority order on the displayed screen.

**[0148]** For example, according to the event information tables shown in (a) of Fig. 21, the priority of event 11 is rewritten to 1 and the priority order of event 12 is rewritten to 3.

**[0149]** The program data producing section 14 sends each event information table including a priority order to the priority processing section 61. For each event information table, the priority processing section 61 performs the following processing with reference to the priority order.

**[0150]** A first method is applied to a "bandwidth adjustment" performed due to the lack of a transponder bandwidth, wherein the data amount of the program information is reduced to a reduced volume suitable to the available bandwidth. To this end, reduction of data amount of each program information is performed in accordance with the reverse order of priority. Thus, the lower-priority program information is reduced early. As shown in (b) of Fig. 21, the event information table is modified through the bandwidth adjustment. According to this embodiment, the event 11 of a high priority order (= 1) keeps the data amount not changed. However, the event 12 (e.g., news program) of a low priority order (= 3) has a reduced data amount for the program information, eliminating the "program content" and "performers' names."

**[0151]** The transmitting section 15 sends the event information table to the broadcast receiving apparatus 20 via the MUX 17. In this case, the transmitted event information table includes no "priority order" item because the broadcast receiving apparatus 20 requires no priority data.

**[0152]** A second method performs reduction of the listing duration of each program information in accordance with the reverse order of priority when any bandwidth adjustment is required. For example, a standard listing schedule may start listing a program five days before the scheduled broadcast time and delete it upon completion of the broadcasting. According to the second method, a low-priority program is for example listed only three days before the scheduled broadcast time.

**[0153]** A third method increases the frequency of display according to the priority order. High-priority program information is displayed at a high frequency, while low-priority program information is displayed at a low frequency. In the transmission of the program information from the priority processing section 61 to the transmitting section 15, the transmitting cycle is increased when the program information has a higher priority order and is reduced when the program information has a lower priority order. Thus, the broadcast receiving apparatus 20 frequently receives the high-priority program information and hardly receives the low-priority program information. This system lets a viewer have a chance to take a look at a program table of the high-priority program information. Fig. 22 shows an example of a cycle setting table and illustrates a way of changing the transmitting cycle according to the priority order.

**[0154]** It is possible to put a priority order to each service (channel) in addition to an event.

**[0155]** Furthermore, according to the first method, it is possible to put a priority order to an item itself of the program information to be erased. For example, the "program content" may have a priority order lower than that of the "performers' names" so that the "program content" is erased earlier than the "performers' names."

**[0156]** As apparent from the foregoing description, this broadcast system makes it possible to flexibly



adjust the bandwidth or the frequency in the display in accordance with the priority order.

[0157] As apparent from the foregoing description, the broadcast system of the present invention makes it possible to make a reservation of each event of a series of programs after checking the content of its event.

[0158] Furthermore, a recording or a reservation of a series of programs can be performed automatically in accordance with the characteristics of these programs.

[0159] Furthermore, it becomes possible to make a reservation of a program, such as a spare program, whose broadcasting is uncertain.

[0160] Furthermore, the present invention presents the uncomfortable blackout from appearing on the TV monitor screen when a program is selected without fulfilling the viewing requirements. Instead, a promotion program introducing this PPV program is displayed. Thus, the users have a sufficient time to check the content of this PPV program before deciding to purchase it or not.

[0161] Furthermore, the program table of each channel or each program can be characterized and differentiated from others when displayed on the TV monitor screen.

[0162] Moreover, by putting a priority order to each program information, it becomes possible to flexibly adjust the bandwidth or the frequency in the display in accordance with the priority order.

[0163] This invention may be embodied in several forms without departing from the spirit of essential characteristics thereof. The present embodiments as described are therefore intended to be only illustrative and not restrictive, since the scope of the invention is defined by the appended claims rather than by the description preceding them. All changes that fall within the metes and bounds of the claims, or equivalents of such metes and bounds, are therefore intended to be embraced by the claims.

[0164] A program information producing apparatus (13) broadcasts program information of a next program belonging to the same program group as a subjective program in addition to the program information of the subjective program. A broadcast receiving apparatus (20) displays the program information of the next program based on the received program information of the subjective program, thereby allowing a viewer to make a reservation of the next program after checking its content during the user viewing each event of a series of programs.

## Claims

1. A broadcast system for broadcasting a program and related program information, comprising:

a program information producing apparatus (13) for broadcasting program information of a subjective program of a program group, said

program information of said subjective program (Fig. 2) including program information of other program belonging to the same program group; and

a broadcast receiving apparatus (20) for receiving said program information of said subjective program (Fig. 2) and displaying said subjective program together with said program information of other program belonging to the same program group.

2. A program information producing and transmitting method for a program information producing apparatus (13), said method comprising the steps of:

producing program information of a subjective program of a program group, said program information of said subjective program (Fig. 2) including program information of other program belonging to the same program group; and transmitting said subjective program and the produced program information of said subjective program.

3. A broadcast system for broadcasting a program and related program information, comprising:

a program information producing apparatus (13) for broadcasting program information of a subjective program of a program group, said program information of said subjective program (Fig. 2) including program information of a next program to be broadcasted next time and belonging to the same program group; and a broadcast receiving apparatus (20) for receiving said program information of said subjective program (Fig. 2) sent from said program information producing apparatus (13) and displaying said subjective program together with said program information of said next program based on the received program information of said subjective program, thereby allowing a viewer to make a reservation of the next program.

4. A program information producing apparatus (13) for a broadcast system broadcasting a program and related program information, said apparatus comprising:

program group information producing means (51) for producing program information of a subjective program of a program group, said program information of said subjective program (Fig. 2) including program information of a next program to be broadcasted next time and belonging to the same program group; and transmitting means (15) for transmitting said

subjective program and said program information (Fig. 2) produced by said program group information producing means (51).

5. A program information producing and transmitting method for a program information producing apparatus (13), said method comprising the steps of:

producing program information of a subjective program of a program group, said program information of said subjective program (Fig. 2) including program information of a next program to be broadcasted next time and belonging to the same program group; and transmitting said subjective program and the produced program information of said subjective program (Fig. 2).

6. A receiving apparatus (20) for a broadcast system, wherein

said receiving apparatus receives program information multiplexed with video and audio data, and said receiving apparatus updates tuning processing in accordance with the received program information (Fig. 3).

7. A receiving apparatus (20) for a broadcast system, wherein

said receiving apparatus receives program information multiplexed with video and audio data, and said receiving apparatus updates recording processing in accordance with the received program information (Fig. 3).

8. A receiving apparatus (20) for receiving program information, comprising:

program group information managing means (52) for reading program information of a next program to be broadcasted next time from program information of a subjective program of a program group; display processing means (22) for displaying the read program information of said next program together with said subjective program; and reserving means (24) for performing reservation processing in response to a user's operation for making a reservation for the next program.

9. A broadcast system for broadcasting a program and related program information, comprising:

a program information producing apparatus (13) for broadcasting program information of a program of a program group, said program information (Fig. 3) including attribute designating a recording method of a program belonging to the same program group; and

a broadcast receiving apparatus (20) for receiving said program information (Fig. 3) produced by said program information producing apparatus (13) and performing the recording of the program in accordance with the designated recording method.

10. A program information producing and transmitting method for a program information producing apparatus (13), said method comprising the steps of:

producing program information of a program of a program group, said program information (Fig. 3) including designation of a recording method of a program belonging to the same program group; and transmitting said produced program information (Fig. 3) including the designation of the recording method.

11. A broadcast system for broadcasting a program and related program information, comprising:

a program information producing apparatus (13) for broadcasting program information of a program of a program group, said program information (Fig. 3) including attribute designating a reservation method of a program belonging to the same program group; and a broadcast receiving apparatus (20) for receiving said program information (Fig. 3) produced by said program information producing apparatus (13) and performing the reservation of the program in accordance with the designated reservation method.

12. A program information producing and transmitting method for a program information producing apparatus (13), said method comprising the steps of:

producing program information of a program of a program group, said program information (Fig. 3) including designation of a reservation method of a program belonging to the same program group; and transmitting said produced program information (Fig. 3) including the designation of the reservation method.

13. A program information producing apparatus (13) for a broadcast system broadcasting a program and related program information, said apparatus com-

prising:

program group information producing means (51) for producing program information of a program of a program group, said program information (Fig. 3) including attribute designating a recording method of a program belonging to the same program group; and transmitting means (15) for transmitting said program information (Fig. 3) produced by said program group information producing means (51).

14. A program information producing apparatus (13) for a broadcast system broadcasting a program and related program information, said apparatus comprising:

program group information producing means (13) for producing program information of a program of a program group, said program information (Fig. 3) including attribute designating a reservation method of a program belonging to the same program group; and transmitting means (15) for transmitting said program information (Fig. 3) produced by said program group information producing means (13).

15. A receiving apparatus (20) for receiving program information, comprising:

reserving means (24) for receiving program information of a program of a program group, and performing reservation processing of a program in the same program group in accordance with attribute involved in the received program information (Fig. 3).

16. A broadcast system for broadcasting a program and related program information, comprising:

a program information producing apparatus (13) for broadcasting program information of a subjective program of a program group, said program information of said subjective program including information of a spare program as to whether said spare program will be broadcasted or not (Figs. 5, 6); and a broadcast receiving apparatus (20) for receiving said program information of said subjective program sent from said program information producing apparatus (13) and displaying said spare program on a program table (Figs. 7, 8) based on the received program information, thereby allowing a viewer to make a reservation of the spare program.

17. A program information producing apparatus (13) for a broadcast system broadcasting a program and related program information, said apparatus comprising:

spare program information producing means (53) for producing program information including a flag (Figs. 5, 6) indicating as to whether a spare program will be broadcasted or not; and transmitting means (15) for transmitting said program information produced by said spare program information producing means (53).

18. A program information producing and transmitting method for a program information producing apparatus (13), said method comprising the steps of:

producing program information of spare programs scheduled in a same broadcast time slot as to whether each of said spare programs will be broadcasted or not; and transmitting said produced program information of said spare programs.

19. A receiving apparatus (20) for receiving program information, comprising:

spare program managing means (54) for producing a program table (Figs. 7, 8) including a spare program based on program information of said spare program; and reserving means (24) for performing reservation processing in response to a user's operation for making a reservation of said spare program.

20. The receiving apparatus in accordance with claim 19, wherein said reserving means (24) is for notifying the user of failure of said reservation when the broadcast of said spare program is canceled (Fig. 9).

21. A broadcast system for broadcasting program information, comprising:

a program information producing apparatus (13) for broadcasting a subjective program with viewing requirements and a related promotion program which are scheduled in a same time slot, and producing and broadcasting program information for each of said subjective and promotion programs (Fig. 11) so as to include linking information for correlating said subjective and promotion programs; and a broadcast receiving apparatus (20) for canceling a display of said subjective program when said viewing requirements are not fulfilled and replacing said display of said subjective program with said promotion program.

tive program by a display of said promotion program linked to said subjective program (Fig. 12).

22. The broadcast system in accordance with claim 21, wherein said broadcast receiving apparatus (20) switches the display of said promotion program to said display of said subjective program upon viewer's input operation for fulfilling said viewing requirements (Fig. 12).

23. A program information producing apparatus (13) for a broadcast system broadcasting program information, said apparatus comprising:

link information producing means (57) for producing program information of each of a subjective program with viewing requirements and a related promotion program scheduled in a same time slot, said program information of said subjective and promotion programs (Fig. 11) including linking information for correlating said subjective program with the related promotion program; and transmitting means (15) for transmitting the program information produced by said link information producing means (57).

24. A program information producing and transmitting method for a program information producing apparatus (13), said method comprising the steps of:

producing program information of each of a subjective program with viewing requirements and a related promotion program scheduled in a same time slot, said program information of said subjective and promotion programs (Fig. 11) including linking information for correlating said subjective program with the related promotion program; and transmitting the program information (Fig. 11) including said linking information for correlating said subjective program with the related promotion program.

25. A receiving apparatus for a broadcast system broadcasting program information, said apparatus comprising:

requirement managing means (25) for checking whether viewing requirements of a subjective program are fulfilled or not when a display of said subjective program is requested; link information managing means (58) for searching a program linked to said subjective program based on program information of said subjective program when any unfulfilled viewing requirement is confirmed by said require-

ment managing means; and display control means (22) for displaying said linked program searched by said link information managing means (58).

26. A broadcast system for broadcasting program information, comprising:

a program information producing apparatus (13) for broadcasting program information including designation of a display format of a program table (Fig. 14); and a broadcast receiving apparatus (20) storing a plurality of display formats for selecting a suitable format among said plurality of display formats in accordance with the designation of said program information producing apparatus (13), thereby displaying the program table (Fig. 15) by using the designated display format.

27. A program information producing apparatus (13) for a broadcast system broadcasting program information, said apparatus comprising:

template information producing means (55) for producing program information (Fig. 14) including designation of a display format of a program table (Fig. 15); and transmitting means (15) for transmitting the program information produced by said template information producing means (55).

28. A program information producing and transmitting method for a program information producing apparatus (13), said method comprising the steps of:

producing program information (Fig. 14) including designation of a display format of a program table (Fig. 15); and transmitting the program information (Fig. 14) including said designation of the display format of the program table (Fig. 15).

29. The program information producing apparatus (13) in accordance with claim 27, wherein said template information producing means (55) is for producing a new display format and said transmitting means (15) is for transmitting the produced new display format.

30. A program information producing and transmitting method for a program information producing apparatus (13), said method comprising the steps of:

producing a new display format; and transmitting the produced new display format.

31. A receiving apparatus (20) for a broadcast system

broadcasting program information, said apparatus comprising template information managing means (56) storing a plurality of display formats for selecting a suitable format among said plurality of display formats in accordance with designation involved in program information (Fig. 14), thereby producing a program table (Fig. 15) by using the designated display format.

32. A broadcast system for broadcasting program information, comprising:

a program information producing apparatus (13) for broadcasting program information relating to program tables for a plurality of regions, said program information (Fig. 17) including information indicating respective regions; and  
a broadcast receiving apparatus (20) for selectively displaying a local program table (Fig. 18) corresponding to a designated region.

33. A program information producing apparatus (13) for a broadcast system broadcasting program information, said apparatus comprising:

local program information producing means (59) for producing program information relating to program tables for a plurality of regions, said program information (Fig. 17) including information indicating respective regions; and  
transmitting means (15) for transmitting the program information (Fig. 17) produced by said local program information producing means (59).

34. A program information producing and transmitting method for a program information producing apparatus (13), said method comprising the steps of:

producing program information relating to program tables for a plurality of regions, said program information (Fig. 17) including information indicating respective regions; and  
transmitting the produced program information (Fig. 17) including the program tables for said plurality of regions and the information indicating respective regions.

35. A receiving apparatus (20) for receiving program information, comprising local program information managing means (60) for selecting program information corresponding to a designated region from program information of a plurality of regions, producing a local program table (Fig. 18) based on the selected program information, and displaying the produced local program table.

36. A program information producing apparatus (13) for a broadcast system broadcasting program information, said apparatus comprising:

means (14) for putting a priority order to program information; and  
means (61) for eliminating supplemental information included in the program information when said program information has a lower priority order, thereby performing a bandwidth adjustment.

37. A program information producing and transmitting method for a program information producing apparatus (13), said method comprising the steps of:

putting a priority order to program information (Fig. 20);  
eliminating supplemental information included in the program information when said program information has a lower priority order, thereby performing a bandwidth adjustment (Fig. 21); and  
transmitting the bandwidth adjusted program information.

38. A program information producing apparatus (13) for a broadcast system broadcasting program information, said apparatus comprising:

means (14) for putting a priority order to program information (Fig. 20); and  
means (61) for shortening a listing duration of a specific program on a program table when said specific program information has a lower priority order, thereby performing a bandwidth adjustment.

39. A program information transmitting method for a program information producing apparatus (13), comprising the steps of:

putting a priority order to program information (Fig. 20); and  
shortening a listing duration of a specific program on a program table when said specific program information has a lower priority order, thereby performing a bandwidth adjustment.

40. A program information producing apparatus (13) for a broadcast system broadcasting program information, said apparatus comprising:

means (14) for putting a priority order to program information (Fig. 20); and  
means (61) for changing a transmission method of the program information in accordance with said priority order.

41. A program information transmitting method for a program information producing apparatus (13), said method comprising the steps of:

putting a priority order to program information (Fig. 20); and  
transmitting program information whose transmission method is changed in accordance with said priority order.

10

42. The program information transmitting method in accordance with claim 41, wherein a transmitting cycle is reduced when said program information has a lower priority order, while the transmitting cycle is increased when said program information has a higher priority order (Fig. 22).

15

43. A program information transmitting method for a program information producing apparatus (13), comprising the steps of:

20

checking a priority order of program information; and  
reducing a transmitting cycle of said program information when said program information has a lower priority order, and increasing the transmitting cycle of said program information when said program information has a higher priority order (Fig. 22).

25

30

44. A program information producing apparatus (13) for a broadcast system broadcasting program information, said apparatus comprising:

program information producing means (14) for producing program information having a priority order (Fig. 20); and  
priority order processing means (61) for changing a content or a transmission method of said program information in accordance with the priority order of said program information.

35

40

45. A program information transmitting method for a program information producing apparatus (13), said method comprising the steps of:

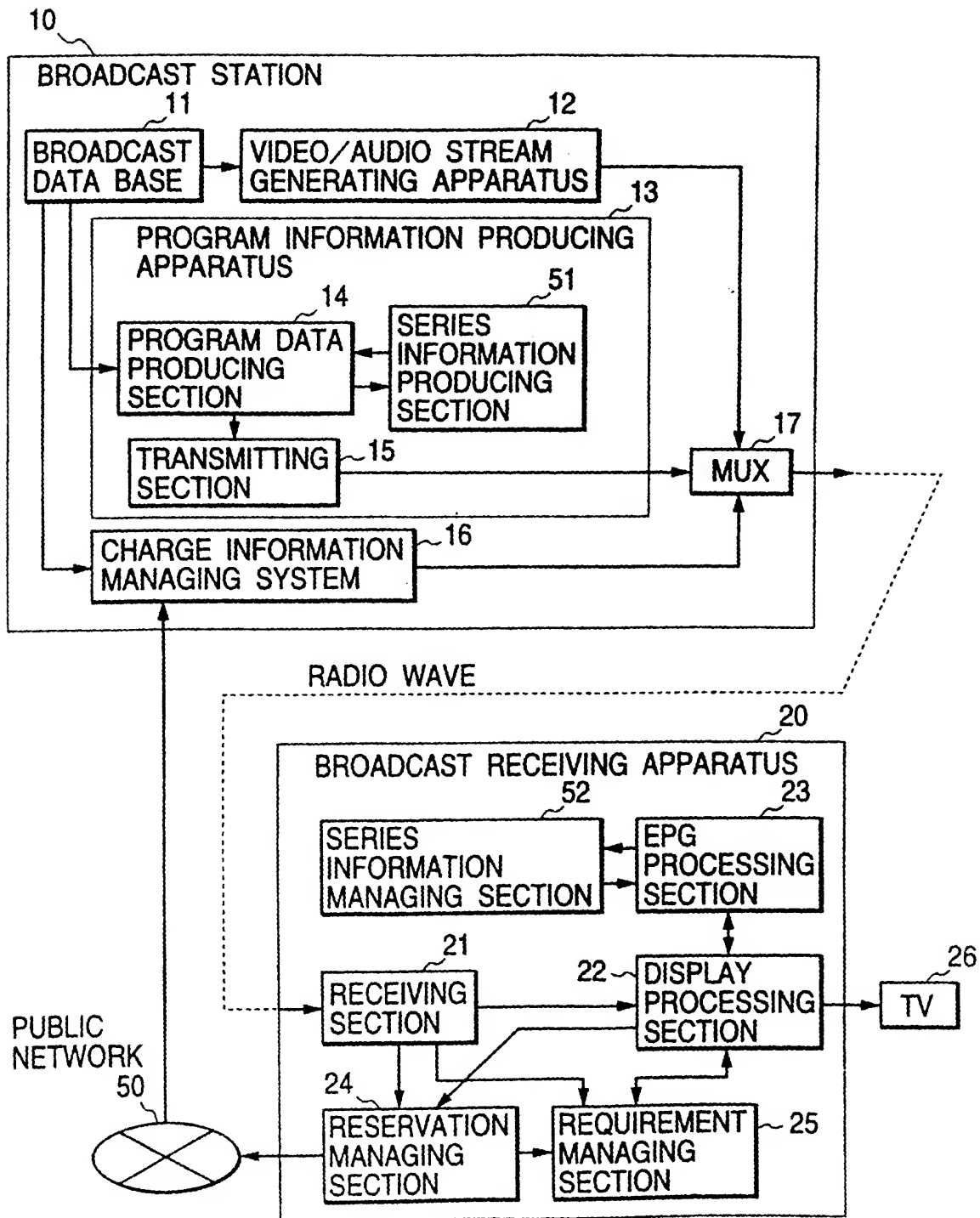
45

putting a priority order to program information (Fig. 20); and  
transmitting said program information whose content or transmission method is changed in accordance with the priority order of said program information.

50

55

FIG. 1



*FIG. 2*

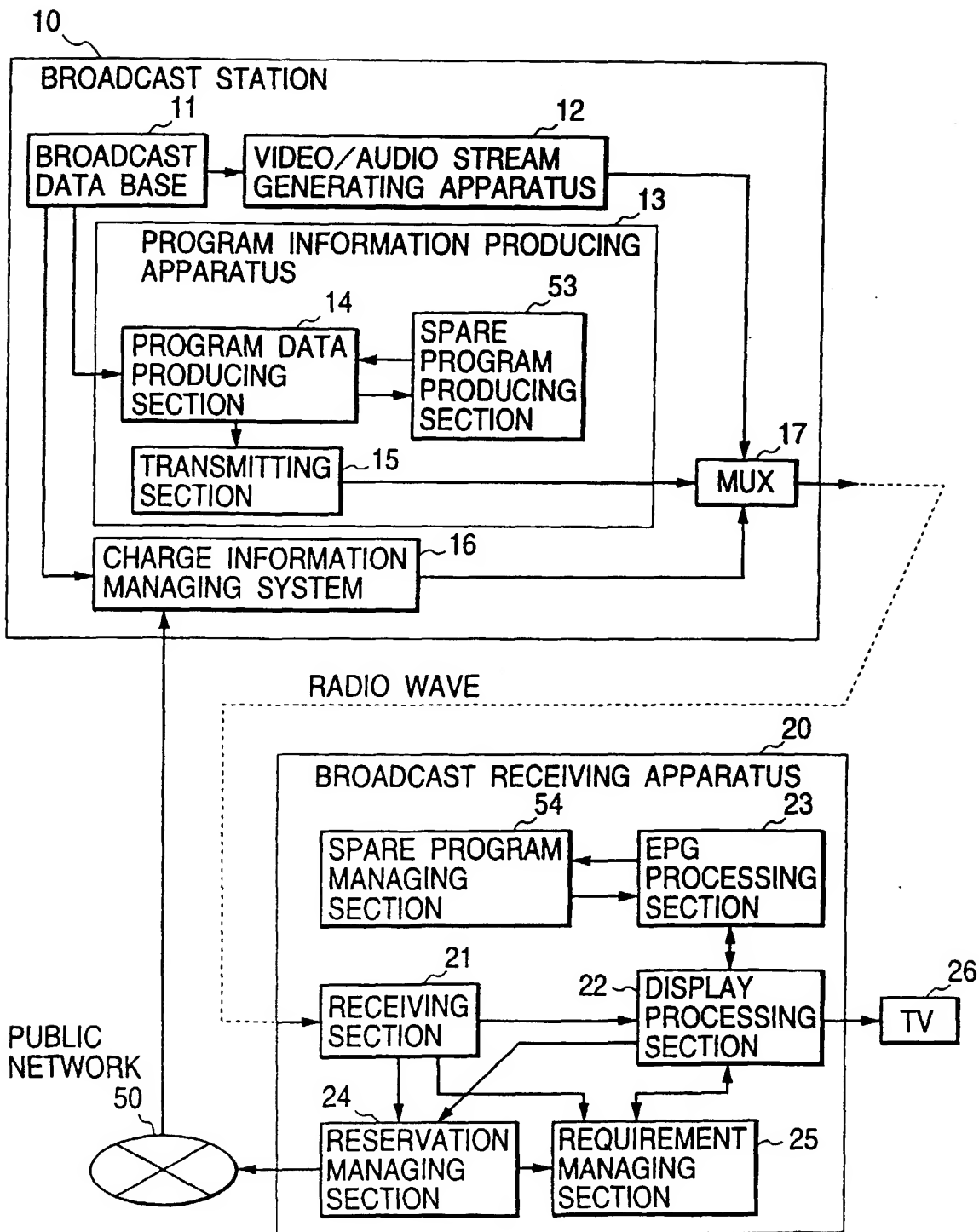
EVENT INFORMATION TABLE													
EVENT 11													
NAME : PROGRAM 11													
SERIES ID : 1													
NEXT EVENT :													
<table> <tr> <td colspan="2">EVENT 12</td></tr> <tr> <td colspan="2">NAME : PROGRAM 12</td></tr> <tr> <td colspan="2">START/END TIME</td></tr> <tr> <td colspan="2">RESERVATION NO. : 12</td></tr> <tr> <td colspan="2">.</td></tr> <tr> <td colspan="2">.</td></tr> </table>		EVENT 12		NAME : PROGRAM 12		START/END TIME		RESERVATION NO. : 12		.		.	
EVENT 12													
NAME : PROGRAM 12													
START/END TIME													
RESERVATION NO. : 12													
.													
.													

*FIG. 3*

EVENT INFORMATION TABLE	
EVENT 11	
NAME : PROGRAM 11	
SERIES ID : 1	
ATTRIBUTE : 1	
EVENT 12	
NAME : PROGRAM 12	
SERIES ID : 1	
ATTRIBUTE : 1	
EVENT 13	
NAME : PROGRAM 13	
SERIES ID : 1	
ATTRIBUTE : 1	
EVENT 21	
NAME : PROGRAM 21	
SERIES ID : 2	
ATTRIBUTE : 2	
EVENT 22	
NAME : PROGRAM 22	
SERIES ID : 2	
ATTRIBUTE : 3	
EVENT 23	
NAME : PROGRAM 23	
SERIES ID : 2	
ATTRIBUTE : 2	



FIG. 4



**FIG. 5**

EVENT INFORMATION TABLE

EVENT 1
NAME : PROGRAM 1 BROADCAST FLAG : 1 SPARE FLAG : 1
SPARE EVENT ID=2 SPARE EVENT ID=3
EVENT 2
NAME : PROGRAM 2 BROADCAST FLAG : 0 SPARE FLAG : 2
EVENT 3
NAME : PROGRAM 3 BROADCAST FLAG : 0 SPARE FLAG : 2

**FIG. 6**

EVENT INFORMATION TABLE

EVENT 1
NAME : PROGRAM 1 BROADCAST FLAG : 0 SPARE FLAG : 1
SPARE EVENT ID=2 SPARE EVENT ID=3
EVENT 2
NAME : PROGRAM 2 BROADCAST FLAG : 1 SPARE FLAG : 2
EVENT 3
NAME : PROGRAM 3 BROADCAST FLAG : 1 SPARE FLAG : 2

*FIG. 7*

PROGRAM TABLE			
19 20 21 22	CHANNEL 1		CHANNEL 2 ...
	MAIN	SPARE	.  .  .
	BASEBALL TELECAST	VARIETY	
		TRAVEL	
	DRAMA "A"		

RESERVATION

*FIG. 8*

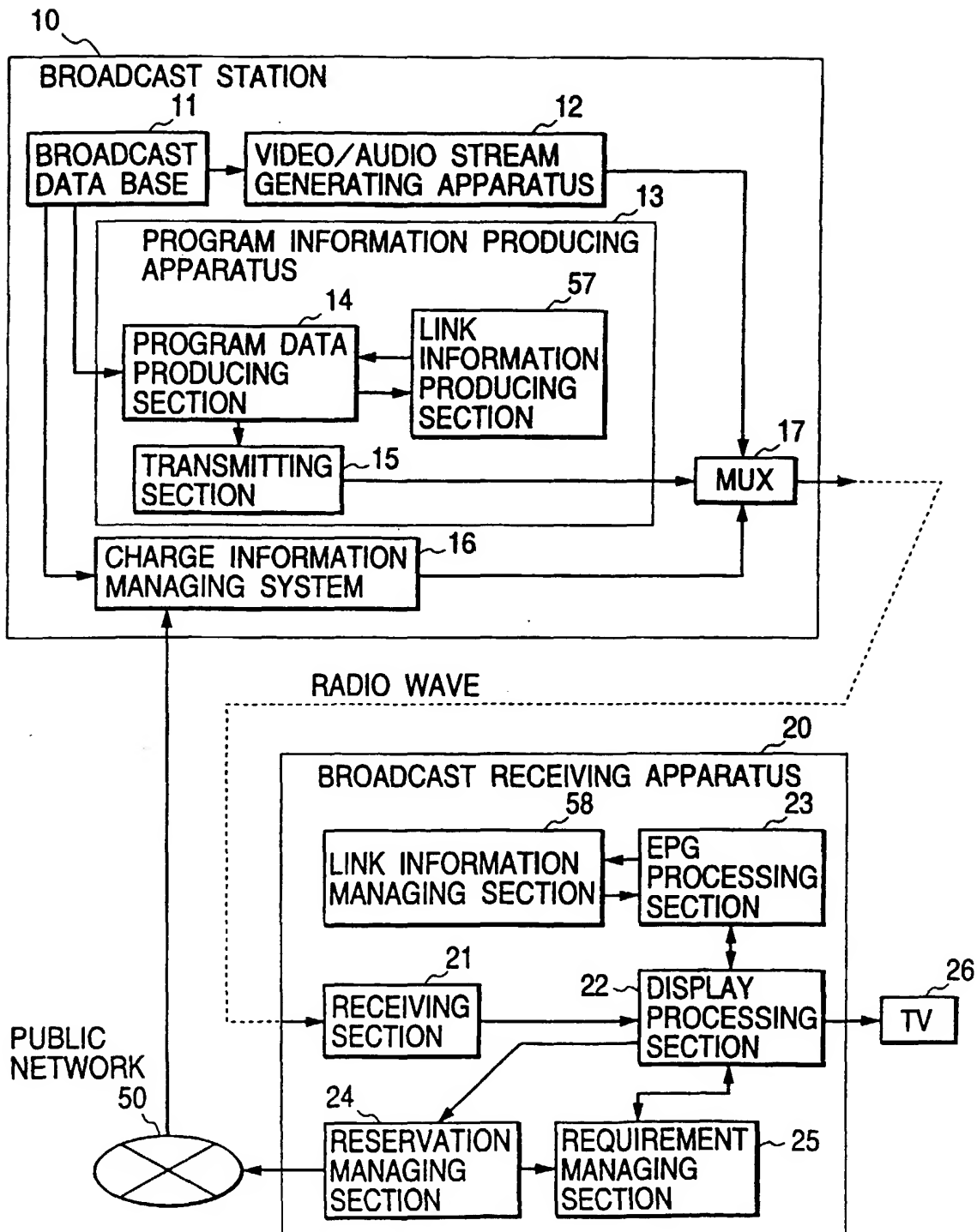
PROGRAM TABLE			
19 20 21 22	CHANNEL 1	CHANNEL 2 ...	
	MAIN		
	VARIETY		
	TRAVEL		
	DRAMA "A"		

RESERVATION

*FIG. 9*

MESSAGE
10/1 CANCELED RESERVATION IS BASEBALL TELECAST FROM 19:00 TO 21:00
OK

FIG. 10



**FIG. 11**

EVENT INFORMATION TABLE

EVENT 11
<LINKED TO> SERVICE ID : 1 EVENT ID : 111
<REQUIREMENTS> NAME : PROGRAM 11 AGE LIMIT : 18 PPV FLAG : 1 CONTRACT TYPE : 2 PRICE : 2000

EVENT 111
<LINKED TO> SERVICE ID : 2 EVENT ID : 11

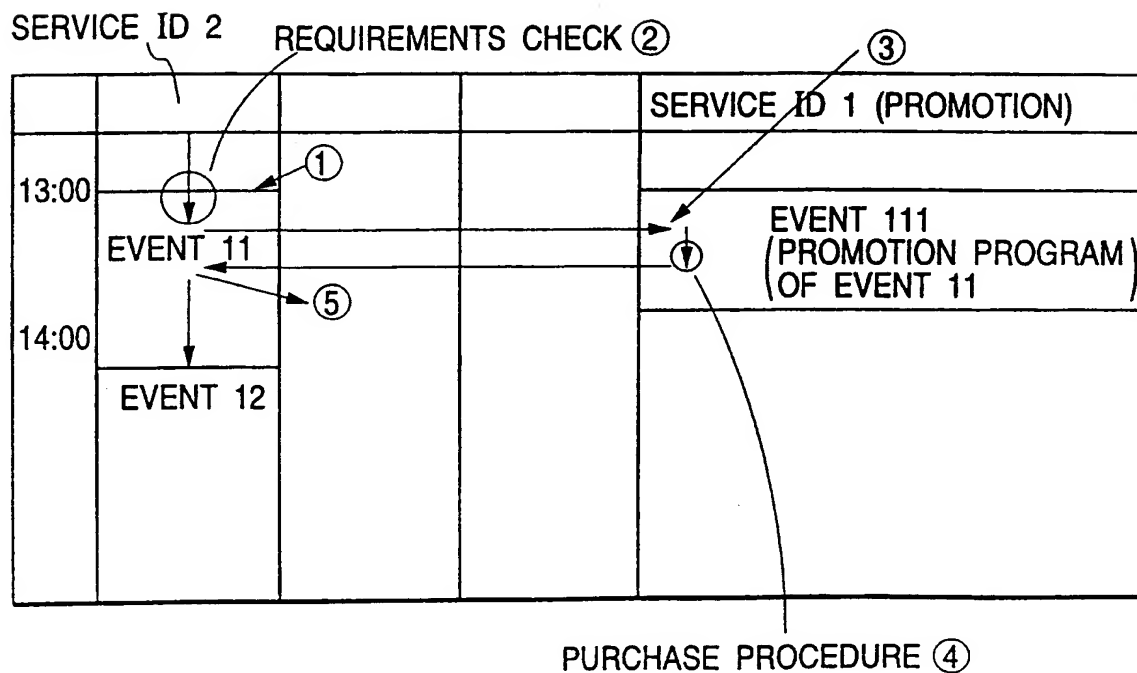
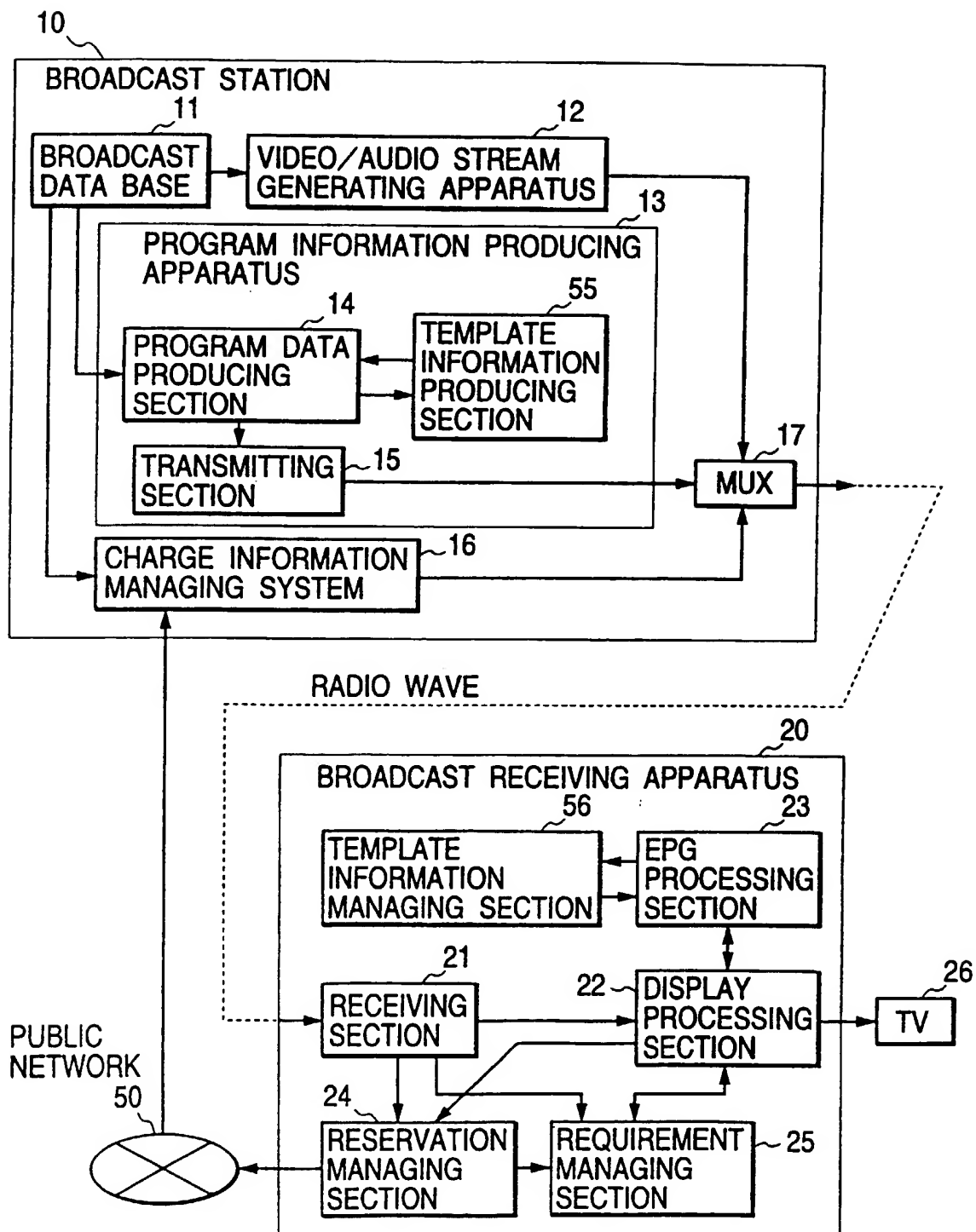
**FIG. 12**

FIG. 13



**FIG. 14**

SERVICE INFORMATION TABLE

SERVICE ID=1 TEMPLATE ID=1
SERVICE ID=2 TEMPLATE ID=2

**FIG. 15**

NEWS CHANNEL PROGRAM TABLE (TEMPLATE 1)

(a)

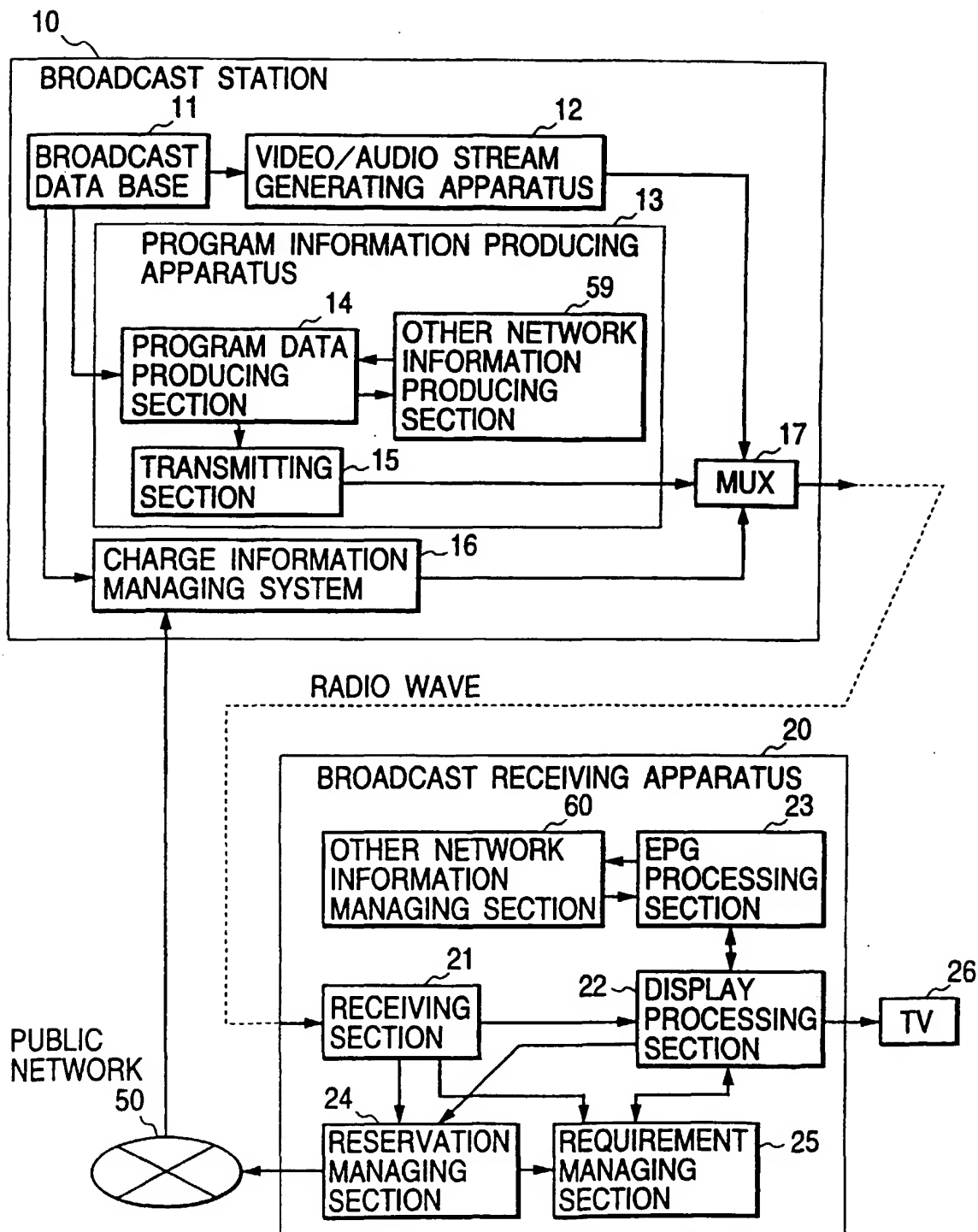
	TITLE	CONTENTS
7	7AM NEWS CASTER : YAMADA	-07:10 TOPICS -07:15 WEATHER -07:23 LOCAL NEWS
8	•	•
•	•	•
•	•	•
•	•	•
•	•	•
22		
23		

SONG CHANNEL PROGRAM TABLE (TEMPLATE 2)

(b)

8	SONG BATTLE SHOW	SINGERS ...
9		
10	...	SINGERS ...
15		

FIG. 16





*FIG. 17*

SERVICE INFORMATION TABLE

SERVICE 11
NETWORK ID : 1 SERVICE ID : 11 NAME : CHANNEL 11 REGION ID : 2

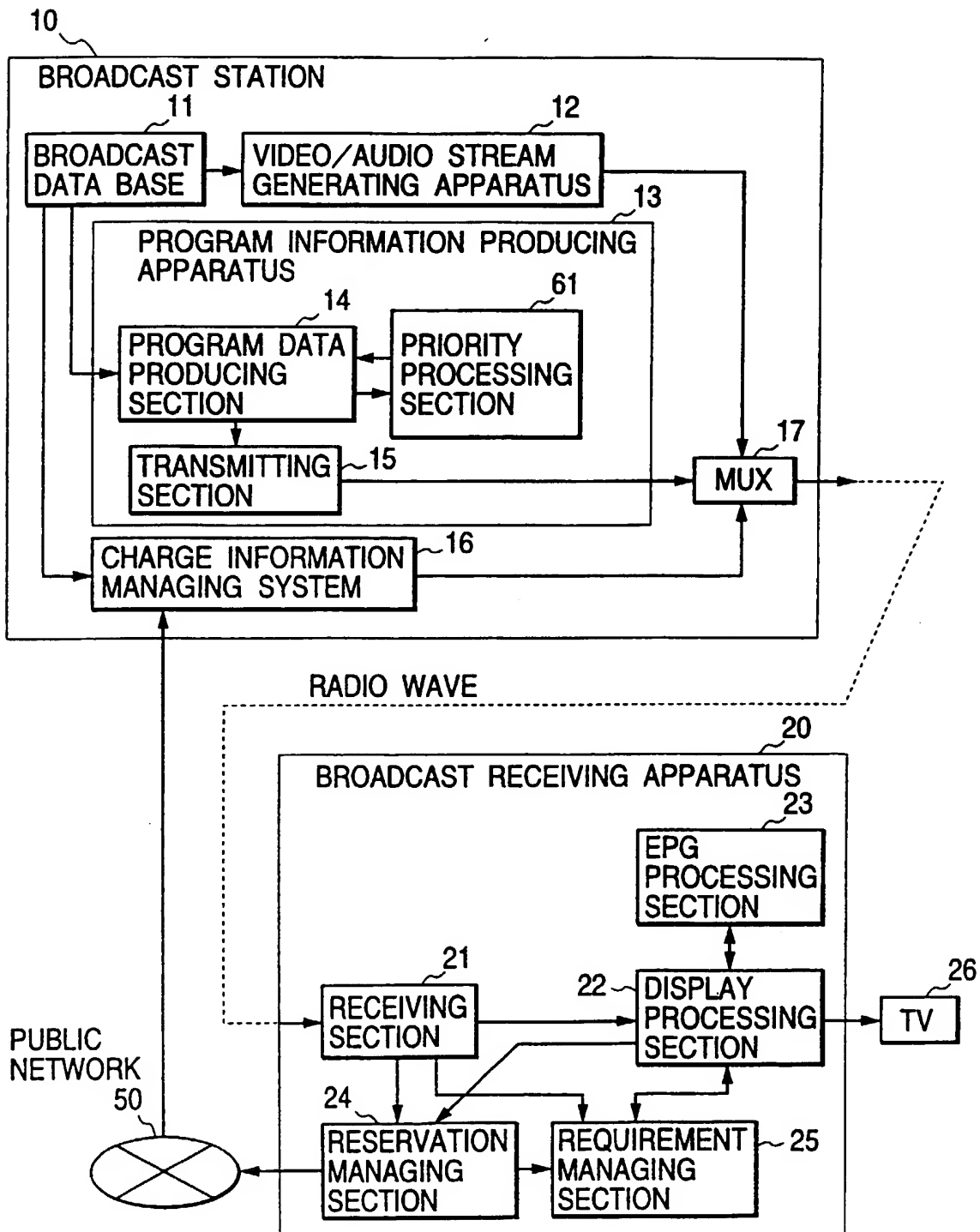
SERVICE 21
NETWORK ID : 2 SERVICE ID : 21 NAME : CHANNEL 21 REGION ID : 2

*FIG. 18*

BS CHANNELS		TERRESTRIAL TV CHANNELS	
101	102	8	10

TV

FIG. 19



*FIG. 20*

(a)

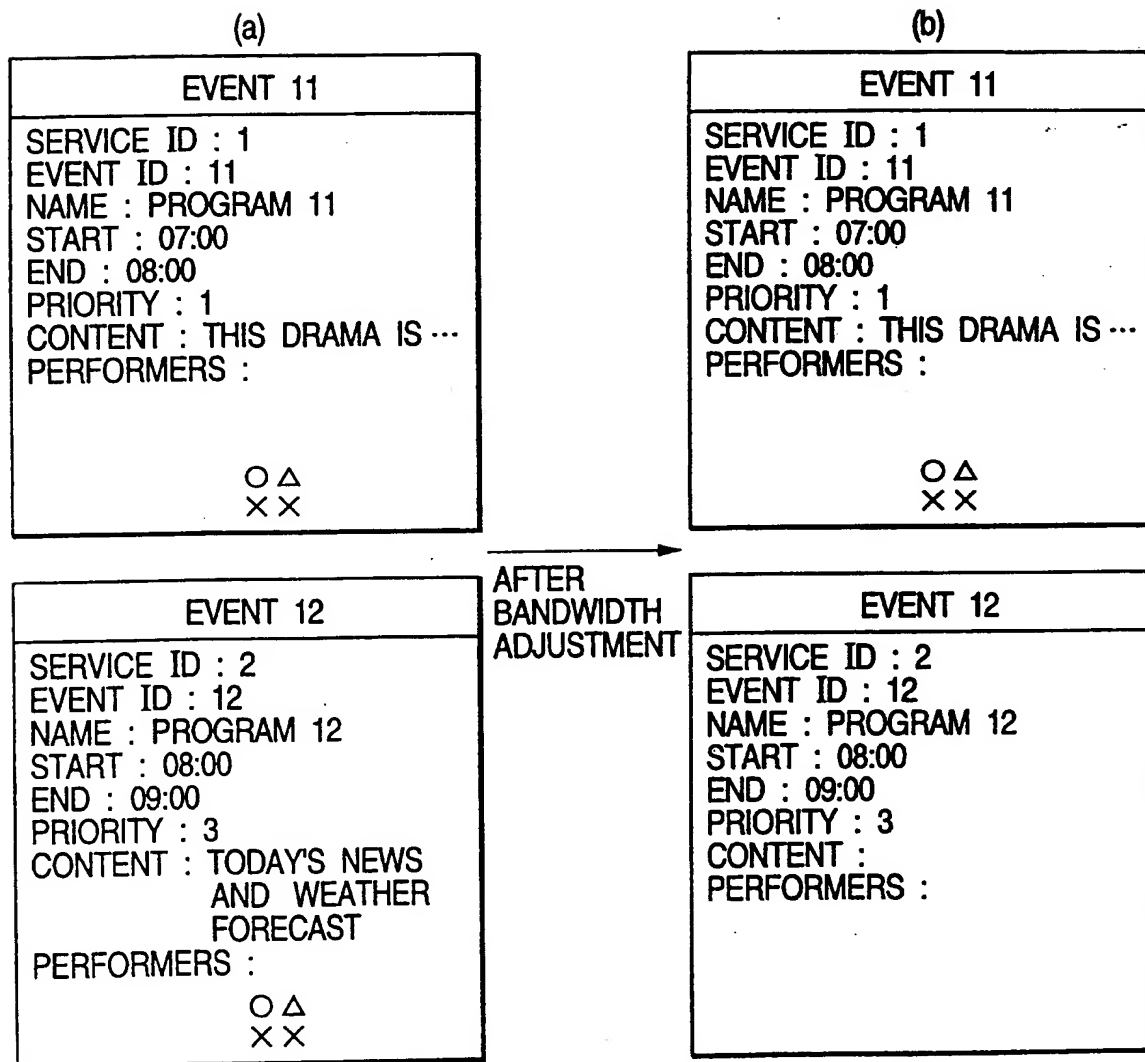
SERVICE TABLE	SELECT
BS : CHANNEL 11	
: CHANNEL 12	
TERRESTRIAL : CHANNEL 21	
: CHANNEL 22	

(b)

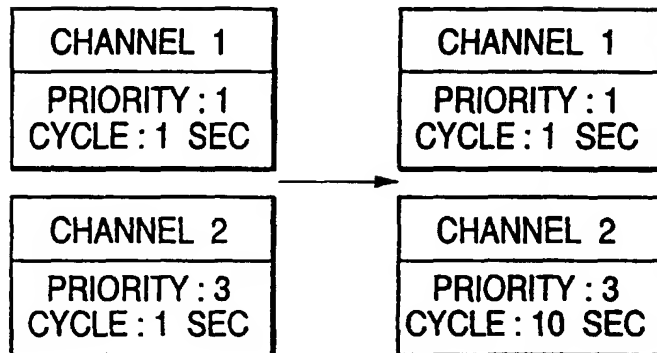
PROGRAM TABLE	SELECT
8:00~9:00	○×△
9:00~12:00	NEWS
12:00~13:30	

(c)

PROGRAM DISPLAY	UPDATE
NAME : SPORTS RELAY	
START/END : 15:00 ~ 17:00	
PRIORITY : 2	
EXPLANATION :	

**FIG. 21**

*FIG. 22*



*FIG. 23*

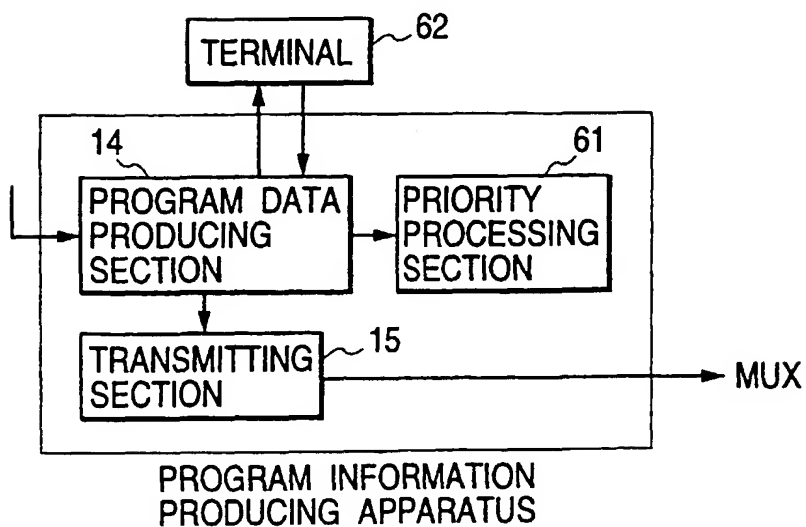


FIG. 24

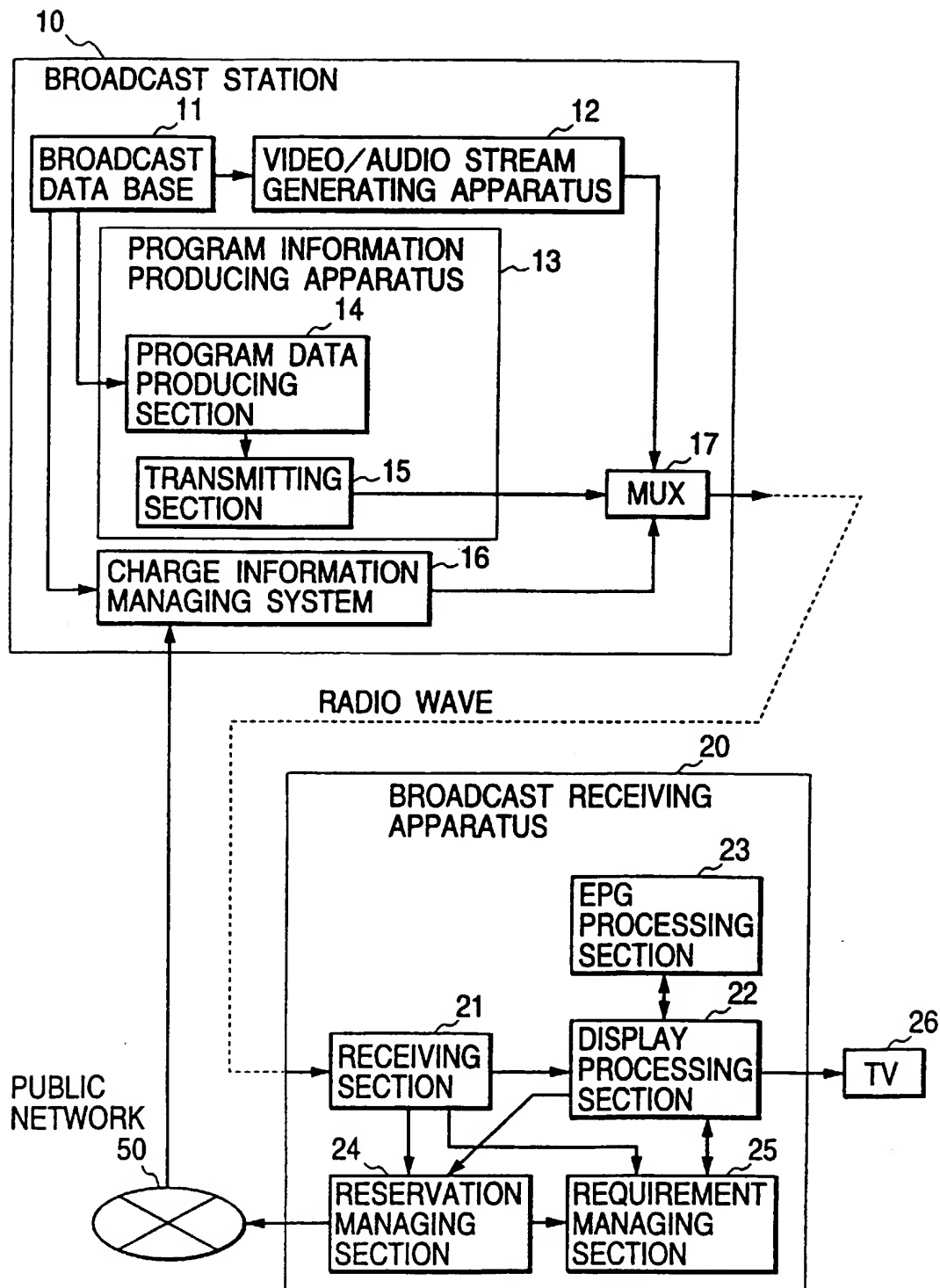
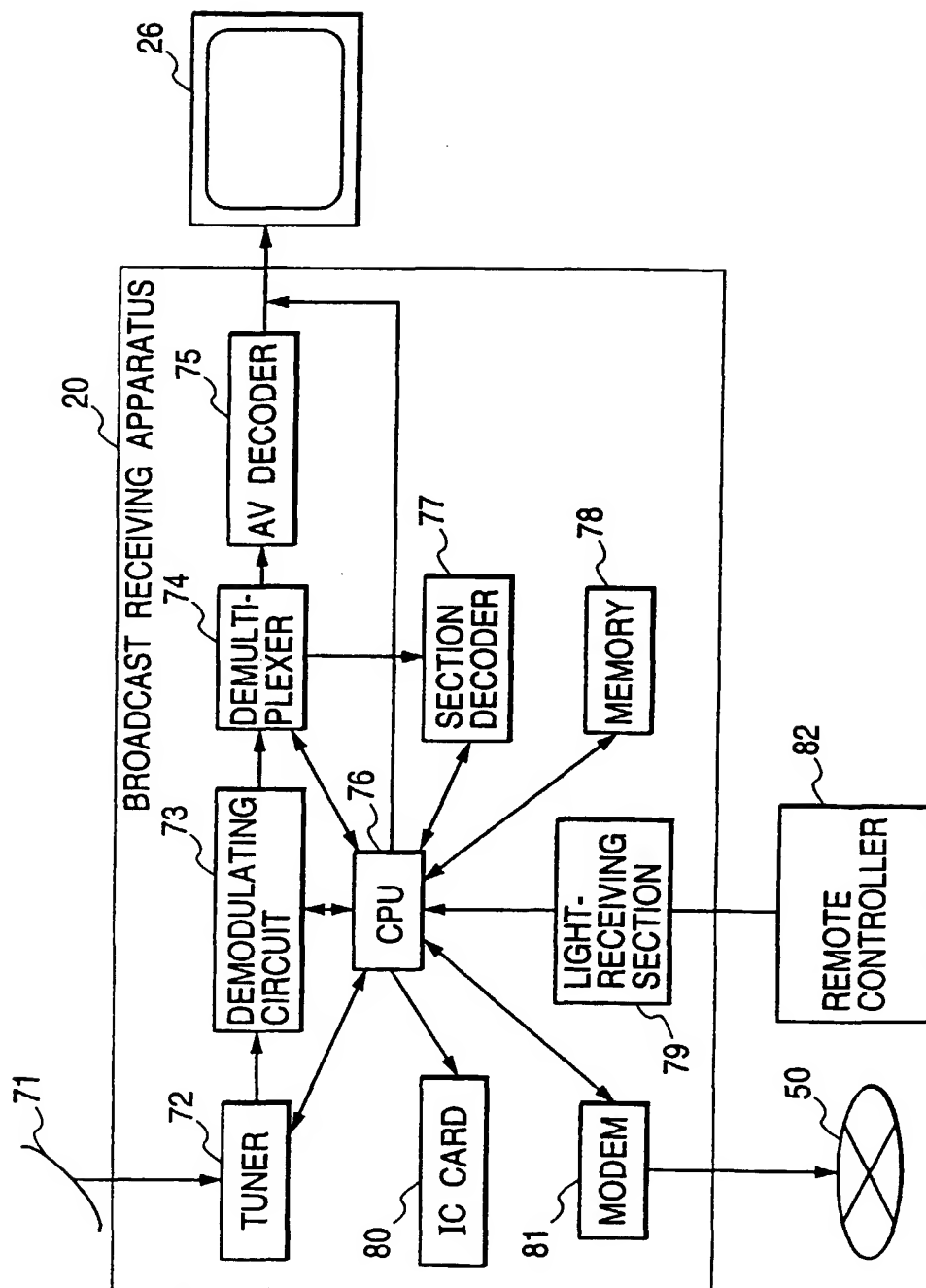


FIG. 25



## **EP0946060A1**

Publication Title:

Menu-driven television program access system and method

Abstract:

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Courtesy of <http://worldwide.espacenet.com>



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## (54) Menu-driven television program access system and method

(57) In a method for providing programming in a television delivery system, the programming is packaged at a television delivery center, wherein the package includes at least one program, and menu information related to the programming packaging is generated. The menu information is provided to terminals and stored therein the terminals. The menu information is displayed as programming menus, wherein a programming menu is displayed on a first portion of a display

coupled to a terminal. When a program is chosen from the displayed programming menu, a program selection based on the program chosen is received from the displayed programming menu. The terminal is switched to a television channel carrying the chosen program, wherein the switching is completed in response to a single control function, and the chosen program is displayed on the display.

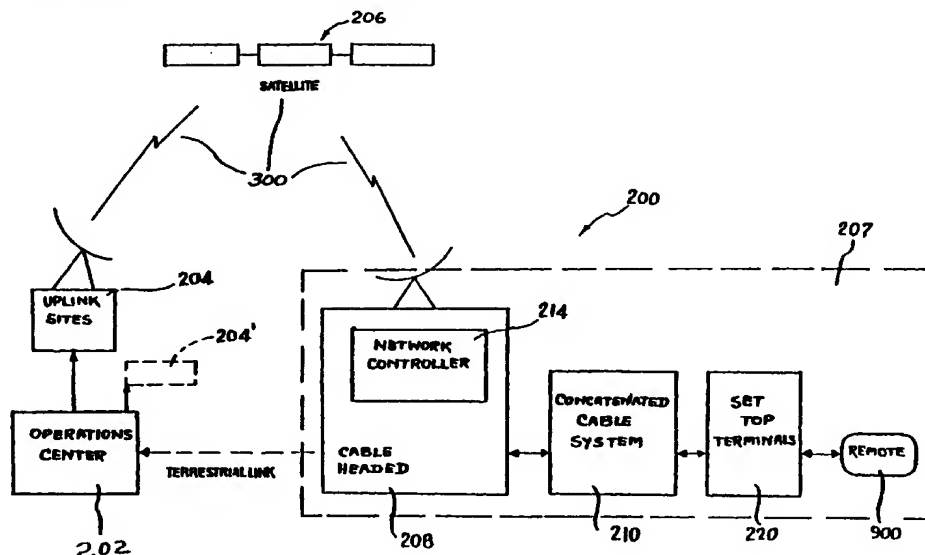


Fig. 1

EP 0 946 060 A1

**Description****RELATED DOCUMENTS**

5 [0001] This application is a divisional of European patent application No. 98 103 750.0, which in turn is a divisional of European patent application No. 94 903 361.7. The following publications are also related: EP-A-0 673 578, EP-A-0 673 579, EP-A-0 673 581, EP-A-0 673 582, EP-A-0 673 583, EP-A-0 732 027, EP-A-0 732 030, EP-A-0 732 031, and US-A-5,307,627.

10 **TECHNICAL FIELD**

[0002] The invention relates to television entertainment systems that provide television programming to consumer homes. More particularly, the invention relates to a menu-driven television program access system and method.

15 **BACKGROUND OF THE INVENTION**

[0003] Advances in television entertainment have been primarily driven by breakthroughs in technology. In 1939, advances on Vladimir Zworykin's picture tube provided the stimulus for NBC to begin its first regular broadcasts. In 1975, advances in satellite technology provided consumers with increased programming to homes.

20 [0004] Many of these technology breakthroughs have produced inconvenient systems for consumers. One example is the ubiquitous three remote control home, having a separate and unique remote control for the TV, cable box and VCR. More recently, technology has provided cable users with 100 channels of programming. This increased program capacity is beyond the ability of many consumer to use effectively. No method of managing the program choices has been provided to consumers.

25 [0005] Consumers are demanding that future advances in television entertainment, particularly programs and program choices, be presented to the consumer in a user friendly manner. Consumer preferences, instead of technological breakthroughs, will drive the television entertainment market for at least the next 20 years. As computer vendors have experienced a switch from marketing new technology in computer hardware to marketing better useability, interfaces and service, the television entertainment industry will also experience a switch from new technology driving the market to consumer useability driving the market.

30 [0006] In order for new television entertainment products to be successful, the products must satisfy consumer demands. TV consumers wish to go from limited viewing choices to a variety of choices, from no control of programming to complete control. Consumers do not wish to pay for one hundred channels when due to lack of programming information, they seldom, if ever, watch programming on many of these channels.

35 [0007] The concepts of interactive television, high definition television and 300-500 channel cable systems in consumer homes will not sell if they are not packaged, delivered and presented in a useable fashion to consumers. The problem is that TV programming is not being managed, packaged, delivered, and presented to consumers in a user friendly manner.

[0008] Consumers are already being bombarded with programming options, numerous "free" cable channels. subscription cable channels and pay-per-view choices. Any further increase in TV entertainment choices will likely bewilder viewers with a mind-numbing array of choices.

[0009] The TV industry has traditionally marketed and sold its programs to consumers in bulk, such as continuous feed broadcast and long-term subscriptions to movie channels. The TV industry is unable to sell its programming in large quantities on a per unit basis, such as the ordering of one program.

45 [0010] In today's television world networks manage the program lineup for individual channels. Each network analyzes ratings for television shows and determines the appropriate schedule or program lineup to gain market share and revenue from advertising. Since each channel is in competition with every other channel, there is no coordinated effort to organize television programming in a manner that primarily suits the viewers.

[0011] Additionally, viewership fragmentation, which has already begun to decrease a channel's or program's market share, will increase. Programming not presented in a user friendly manner will suffer with a decrease in viewership and revenue.

[0012] And finally, with the imminent introduction of digital television technology, current television delivery systems do not have the capabilities or features necessary to operate in the digital environment.

[0013] What is needed is a method of organizing programming to be offered to viewers.

55 [0014] What is needed is a television program delivery system that can be operated in a distributive fashion and controlled from one or more national centers.

[0015] What is needed is an Operations Center for a system which can gather television programming in a variety of formats, package the programs, deliver the programs, and present the programs through a user friendly interface which

allows the consumer to easily select from among the many program choices.

**[0016]** What is needed is an Operations Center that is capable of handling hundreds of programs in different formats.

**[0017]** What is needed is an Operations Center that is expandable for future types of programming.

**[0018]** What is needed is needed is an Operations Center that can control certain features and software of a television delivery system.

**[0019]** What is needed is a Operations Center that operates in the digital audio/video environment.

**[0020]** What is needed is an Operations Center that formulates program menus for viewer use.

**[0021]** What is needed is a computer assisted program packaging system.

**[0022]** What is needed is an Operations Center that includes a method for billing consumers.

**[0023]** What is needed is an Operations Center that analyzes data on programs watched by viewers

**[0024]** The present invention is addressed to fulfillment of these needs.

## **SUMMARY OF INVENTION**

**[0025]** This invention is a center for controlling the operations of a digital television program delivery system. Specifically, the present invention is an Operations Center that allows for the organizing and packaging of television programs for transmission in a television delivery system.

**[0026]** The Operations Center is the nerve center of the television program delivery system. It receives data on viewership behavior and utilizes the data to assist in packaging programs for future viewing. The Operations Center is a particularly useful invention for television delivery systems which will provide users with the ability to select programs from on-screen menus.

**[0027]** The Operations Center's primary component is a computer assisted packaging system (CAP), which makes use of the necessary hardware and software to control and transmit programming signals over a television delivery system. This computer assisted packaging system creates the program lineup or packaging of programs and the packaging of menu and control information for later transmission and use in the cable television systems. The CAP can be specially designed to generate graphical menu displays for user selection of programs. The hardware and software for controlling and transmitting programming signals over the television delivery system is particularly useful in large television delivery systems which include satellite transmissions to cable headends.

**[0028]** The software of the CAP performs the functions of gathering analog (and/or digital) program signals from a variety of sources such as broadcast television, premium channels, and video disk. The software also packages the programs efficiently for the available bandwidth and for subscriber viewing through computer assisted creation of program line-up and allocating of bandwidth. The line-ups are created to effectively group programming for display in menus by categories. The television programs are packaged with the program control information (such as cost for viewing certain program) and menu information.

**[0029]** The Operations Center of the present invention provides a method for remote management and control of local cable and CATV programs available and on-screen menu displays shown to subscribers. The Operations Center's computer software programs and hardware provide "real-time" control over cable and CATV systems. By transmitting appropriate control information the Operations Center has the ability to change allocation of programs across physical channels, update menu information (from the Operations Center location), reprogram menu formats and menu flow, and change or augment a packaged program signal sent to a particular region of the country. The Operations Center is able to control remotely certain features and software of the set top terminals and if necessary reprogram menu display software stored at the set top terminals.

**[0030]** In order to properly manage program lineups, the Operations Center acquires viewer information on programs watched. Such viewer information includes information about the buy rates of specific shows, viewer preferences for programming, and the like, gathered by recording viewer transactions. A compilation of viewer information data is needed in order to make decisions on future individualized program lineup and program packaging. In addition, allocation of menu space and construction of menus is aided by the use of viewer information data. This information is received from the set top terminals using a feedback loop. usually through the cable headends.

**[0031]** The present invention is not only able to operate in the digital environment but introduces many new features to television program delivery.

**[0032]** It is an object of this invention to provide a system for efficiently organizing television programs to be offered to viewers.

**[0033]** It is an object of this invention to provide an Operations Center for a television program delivery system.

**[0034]** It is an object of this invention to provide an Operations Center for a television program delivery system which can gather television programming in a variety of formats, package the programs, and deliver the packaged programs.

**[0035]** It is an object of this invention to provide an Operations Center for a program delivery system which presents programming viewing options to the consumer through a user friendly interface which allows the consumer to easily select from among the many program choices.

[0036] It is an object of this invention to provide an Operations Center that is capable of handling video/audio programming in different formats.

[0037] It is an object of this invention to provide an Operations Center capable of offering interactive television, high definition television (HDTV) and/or other advanced television features.

5 [0038] It is an object of this invention to provide an Operations Center that can control software and program features at the cable headend.

[0039] It is an object of this invention to provide an Operations Center that can control and if necessary reprogram set top terminals.

[0040] It is an object of this invention to provide an Operations Center for a digital program delivery system.

10 [0041] It is an object of this invention to provide an Operations Center that designs program menus.

[0042] It is an object of this invention to provide an Operations Center that uses data on programs viewed to create or aid in the selection of program line-ups.

[0043] It is an object of this invention to provide a computer assisted program packaging system for a television program delivery system.

15 [0044] These and other objects and advantages of the invention will become obvious to those skilled in the art upon review of the following description, the attached drawings and appended claims.

## **DESCRIPTION OF THE DRAWINGS**

20 [0045]

Figure 1 is a diagram of the primary components of the television delivery system.

Figure 2 is an overview of the television delivery system operations.

Figure 3 is a schematic of the operation of the primary components of the system.

25 Figure 4 is a schematic of the primary components of the Computer Assisted Packaging System (CAP).

Figure 5 is a more detailed schematic of the hardware of the Operations Center and CAP.

Figure 6a is a chart of the program control information carried by the program control information signal.

Figure 6b shows a bit-wise data format for program control information.

30 Figure 7 is a block diagram showing a Delivery Control Processor Unit and a Computer Assisted Packaging Apparatus.

Figure 8 is a schematic of the subroutines for the CAP software.

Figure 9 is a software flowchart representing CAP operations.

Figure 10 is a diagram of the database structure for the databases supporting the operations of the CAP.

Figure 11 is a block diagram of the Operations Center and Master Control Site.

35 Figure 12 is a block diagram of the computer assisted packaging shown in figure 11.

Figure 13 is a flow chart of the processing occurring at the Operations Center.

Figure 14 is a diagram of the bandwidth allocation for a 750 Mhz system.

Figure 15 is a diagram/chart of the compressed channel allocation for the system.

40 Figure 16 is a diagram showing how three cable television systems each with a different bandwidth may use the program delivery system and operations center of the present invention simultaneously.

Figure 17 is a diagram showing three different cable headend systems, each system receiving the entire satellite signal and stripping those parts of the signal which cannot be handled by the local cable system.

Figure 18 is a diagram showing dynamic change in bandwidth allocation from a typical week day prime time program signal to a Saturday afternoon program signal.

45 Figure 19 is a drawing of a broadcast television menu screen to be displayed on a set top terminal.

Figure 20 is a drawing of a bit movie menu screen to be displayed on a set top terminal.

Figure 21 is a drawing of a hit movie description menu screen to be displayed on a set top terminal.

## **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT**

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### **A. Television Program Delivery System Description**

#### **1. Introduction**

55 [0046] Figure 1 shows the present invention as part of an expanded cable television program delivery system 200 that dramatically increases programming capacity using compressed transmission of television program signals. Developments in digital bandwidth compression technology now allow much greater throughput of television program signals over existing or slightly modified transmission media. The program delivery system 200 shown provides subscribers

with a user friendly interface to operate and exploit a six-fold or more increase in current program delivery capability.

**[0047]** Subscribers are able to access an expanded television program package and view selected programs through a menu-driven access scheme that allows each subscriber to select individual programs by sequencing a series of menus. The menus are sequenced by the subscriber using simple alpha-numeric and iconic character access or moving a cursor or highlight bar on the TV screen to access desired programs by simply pressing a single button, rather than recalling from memory and pressing the actual two or more digit numeric number assigned to a selection. Thus, with the press of a single button, the subscriber can advance from one menu to the next. In this fashion, the subscriber can sequence the menus and select a program from any given menu. The programs are grouped by category so that similar program offerings are found on the same menu.

## 2. Major System Components

**[0048]** In its most basic form, the system uses a program delivery system 200 in conjunction with a conventional concatenated cable television system 210. The program delivery system 200 generally includes (i) at least one operations center 202, where program packaging and control information are created and then assembled in the form of digital data. (ii) a digital compression system, where the digital data is compressed, combined/multiplexed, encoded, and mapped into digital signals for satellite transmission to the cable headend 208, and (iii) a set of in-home decompressors. The program delivery system 200 transports the digital signals to the cable headend 208 where the signals are transmitted through a concatenated cable television system 210. Within the cable headend 208, the received signals may be decoded, demultiplexed, managed by a local central distribution and switching mechanism, combined and then transmitted to the set top terminal 220 located in each subscriber's home over the cable system 210. Although concatenated cable systems 210 are the most prevalent transmission media to the home, telephone lines, cellular networks, fibreoptics, Personal Communication Networks and similar technology for transmitting to the home can be used interchangeably with this program delivery system 200.

**[0049]** The delivery system 200 has a reception region 207 with an in-home decompression capability. This capability is performed by a decompressor housed within a set top terminal 220 in each subscriber's home. The decompressor remains transparent from the subscriber's point of view and allows any of the compressed signals to be demultiplexed and individually extracted from the composite data stream and then individually decompressed upon selection by the subscriber. The decompressed video signals are converted into analog signals for television display. Such analog signals include NTSC formatted signals for use by a standard television. Control signals are likewise extracted and decompressed and then either executed immediately or placed in local storage such as a RAM. Multiple sets of decompression hardware may be used to decompress video and control signals. The set top terminal 220 may then overlay or combine different signals to form the desired display on the subscriber's television. Graphics on video or picture-on-picture are examples of such a display.

**[0050]** Although a single digital compression standard (e.g., MPEG) may be used for both the program delivery system 200 and the concatenated cable system 210, the compression technique used may differ between the two systems. When the compression standards differ between the two media, the signals received by the cable headend 208 must be decompressed before transmission from the headend 208 to the set top terminals 220. Subsequently, the cable headend 208 must recompress and transmit the signals to the set top terminal 220, which would then decompress the signals using a specific decompression algorithm.

**[0051]** The video signals and program control signals received by the set top terminal 220 correspond to specific television programs and menu selections that each subscriber may access through a subscriber interface. The subscriber interface is a device with buttons located on the set top terminal 220 or on a portable remote control 900. In the preferred system embodiment, the subscriber interface is a combined alpha-character, numeric and iconic remote control device 900, which provides direct or menu-driven program access. The preferred subscriber interface also contains cursor movement and go buttons as well as alpha, numeric and iconic buttons. This subscriber interface and menu arrangement enables the subscriber to sequence through menus by choosing from among several menu options that are displayed on the television screen. In addition, a user may bypass several menu screens and immediately choose a program by selecting the appropriate alpha-character, numeric or iconic combinations on the subscriber interface. In the preferred embodiment, the set top terminal 220 generates the menus that are displayed on the television by creating arrays of particular menu templates, and the set top terminal 220 displays a specific menu or submenu option for each available video signal.

## 3. Operations Center and Digital Compression System

**[0052]** The operations center 202 performs two primary services, packaging television programs and generating the program control information signal. At the operations center 202, television programs are received from external program sources in both analog and digital form. Figure 2 shows an embodiment of the operations center receiving signals

from various external sources 212. Examples of the external program sources are sporting events, children's programs, specialty channels, news or any other program source that can provide audio or visual signals. Once the programs are received from the external program sources, the operations center 202 digitizes (and preferably compresses) any program signals received in analog form. The operations center 202 may also maintain an internal storage of programs.

5 The internally stored programs may be in analog or digital form and stored on permanent or volatile memory sources, including magnetic tape or RAM. Subsequent to receiving programming, the operations center 202 packages the programs into the groups and categories which provide the optimal marketing of the programs to subscribers. For example, the operations center 202 may package the same programs into different categories and menus for weekday, prime-time viewing and Saturday afternoon viewing. Also, the operations center 202 packages the television programs in a  
10 manner that enables both the various menus to easily represent the programs and the subscribers to easily access the programs through the menus.

**[0053]** The packaging of the digital signals is typically performed at the operations center 202 by computer assisted packaging equipment (CAP). The CAP system normally includes at least one computer monitor, keyboard, mouse, and standard video editing equipment. A programmer packages the signals by entering certain information into the CAP.

15 This information includes the date, time slot, and program category of the various programs. The programmer and the CAP utilize demographic data and ratings in performing the packaging tasks. After the programmer selects the various programs from a pool of available programs and inputs the requisite information, the programmer, with assistance from the CAP, can select the price and allocate transponder space for the various programs. After the process is complete, the CAP displays draft menus or program schedules that correspond to the entries of the programmer. The CAP may  
20 also graphically display allocation of transponder space. The programmer may edit the menus and transponder allocation several times until satisfied with the programming schedule. During the editing, the programmer may direct the exact location of any program name on a menu with simple commands to the CAP.

**[0054]** The packaging process also accounts for any groupings by satellite transponder which are necessary. The operations center 202 may send different groups of programs to different cable headends 208 and/or set top terminals 220. One way the operations center 202 may accomplish this task is to send different program packages to each transponder. Each transponder, or set of transponders, then relays a specific program package to specific cable headends 208 and/or set top terminals 220. The allocation of transponder space is an important task performed by the operations center 202.

**[0055]** The operations center 202 may also "insert" directions for filling local available program time in the packaged signal to enable local cable and television companies to fill the program time with local advertising and/or local programming. Consequently, the local cable headends 208 are not constrained to show only programs transmitted from the operations center 202. New set top converters will incorporate both digital and analog channels. Therefore, the cable headend 208 may combine analog signals with the digital signals prior to transmitting the program signals to the set top terminals 220.

35 **[0056]** After the CAP packages the programs, it creates a program control information signal to be delivered with the program package to the cable headend 208 and/or set top terminal 220. The program control information signal contains a description of the contents of the program package, commands to be sent to the cable headend 208 and/or set top terminal 220, and other information relevant to the signal transmission.

**[0057]** In addition to packaging the signal, the operations center 202 employs digital compression techniques to  
40 increase existing satellite transponder capacity by at least a 4:1 ratio, resulting in a four-fold increase in program delivery capability. A number of digital compression algorithms currently exist which can achieve the resultant increase in capacity and improved signal quality desired for the system. The algorithms generally use one or more of three basic digital compression techniques: (1) within-frame (intraframe) compression, (2) frame-to-frame (interframe) compression, and (3) within carrier compression. Specifically, in the preferred embodiment, the MPEG 2 compression method  
45 is used. After digital compression, the signals are combined (multiplexed) and encoded. The combined signal is subsequently transmitted to various uplink sites 204.

**[0058]** There may be a single uplink site 204 or multiple uplink sites (represented by 204', shown in phantom in Figure 1) for each operation center 202. The uplink sites 204 may either be located in the same geographical place or may be located remotely from the operations center 202. Once the composite signal is transmitted to the uplink sites 204, the  
50 signal may be multiplexed with other signals, modulated, upconverted and amplified for transmission over satellite. Multiple cable headends 208 may receive such transmissions.

**[0059]** In addition to multiple uplinks, the delivery system 200 may also contain multiple operations centers. The preferred method for using multiple operations centers is to designate one of the operations centers as a master operations center and to designate the remaining operations centers as slave operations centers. In this configuration, the master  
55 operations center coordinates various functions among the slave operations centers such as synchronization of simultaneous transmissions and distributes the operations workload efficiently.

## 4. Cable Headend

**[0060]** After the operations center 202 has compressed and encoded the program signals and transmitted the signals to the satellite, the cable headend 208 receives and further processes the signals before they are relayed to each set top terminal 220. Each cable headend site is generally equipped with multiple satellite receiver dishes. Each dish is capable of handling multiple transponder signals from a single satellite and sometimes from multiple satellites.

**[0061]** With reference to Figure 3, as an intermediary between the set top terminal 220 and the operations center 202 and master control uplink site 211 (or other remote site), the cable headend 208 performs two primary functions. First, the cable headend 208 acts as a distribution center, or signal processor, by relaying the program signal to the set top terminal 220 in each subscriber's home. In addition, the cable headend 208 acts as a network controller 214 by receiving information from each set top terminal 220 and passing such information on to an information gathering site such as the operations center 202.

**[0062]** Figure 3 shows an embodiment where the cable headend 208 and the subscriber's home are linked by certain communications media 216. In this particular embodiment, analog signals, digitally compressed signals, other digital signals and up-stream/interactivity signals are sent and received over the media 216. The cable headend 208 provides such signalling capabilities in its dual roles as a signal processor 209 and network controller 214.

**[0063]** As a signal processor 209, the cable headend 208 prepares the program signals that are received by the cable headend 208 for transmission to each set top terminal 220. In the preferred system, the signal processor 209 re-routes or demultiplexes and recombines the signals and digital information received from the operations center 202 and allocates different portions of the signal to different frequency ranges. Cable headends 208 which offer different subscribers different program offerings may allocate the program signals from the operations center 202 in various manners to accommodate different viewers. The signal processor 209 may also incorporate local programming and/or local advertisements into the program signal and forward the revised signal to the set top terminals 220. To accommodate this local programming availability, the signal processor 209 must combine the local signal in digital or analog form with the operations center program signals. If the local cable system uses a compression standard that is different than the one used by the operations center 202, the signal processor 209 must also decompress and recompress incoming signals so they may be properly formatted for transmission to the set top terminals 220. This process becomes less important as standards develop (i.e., MPEG 2). In addition, the signal processor 209 performs any necessary signal decryption and/or encryption.

**[0064]** As a network controller 214, the cable headend 208 performs the system control functions for the system. The primary function of the network controller 214 is to manage the configuration of the set top terminals 220 and process signals received from the set top terminals 220. In the preferred embodiment, the network controller 214 monitors, among other things, automatic poll-back responses from the set top terminals 220 remotely located at each subscribers' home. The polling and automatic report-back cycle occurs frequently enough to allow the network controller 214 to maintain accurate account and billing information as well as monitor authorized channel access. In the simplest embodiment, information to be sent to the network controller 214 will be stored in RAM within each subscriber's set top terminal 220 and will be retrieved only upon polling by the network controller 214. Retrieval may, for example, occur on a daily, weekly or monthly basis. The network controller 214 allows the system to maintain complete information on all programs watched using a particular set top terminal 220.

**[0065]** The network controller 214 is also able to respond to the immediate needs of a set top terminal 220 by modifying a program control information signal received from the operations center 202. Therefore, the network controller 214 enables the delivery system to adapt to the specific requirements of individual set top terminals 220 when the requirements cannot be provided to the operations center 202 in advance. In other words, the network controller 214 is able to perform "on the fly programming" changes. With this capability, the network controller 214 can handle sophisticated local programming needs such as, for example, interactive television services, split screen video, and selection of different foreign languages for the same video. In addition, the network controller 214 controls and monitors all compressors and decompressors in the system.

**[0066]** The delivery system 200 and digital compression of the preferred embodiment provides a one-way path from the operations center 202 to the cable headend 208. Status and billing information is sent from the set top terminal 220 to the network controller 214 at the cable headend 208 and not directly to the operations center 202. Thus, program monitoring and selection control will take place only at the cable headend 208 by the local cable company and its decentralized network controllers 214 (i.e., decentralized relative to the operations center 202, which is central to the program delivery system 200). The local cable company will in turn be in communication with the operations center 202 or a regional control center (not shown) which accumulates return data from the set top terminal 220 for statistical or billing purposes. In alternative system embodiments, the operations center 202 and the statistical and billing sites are collocated. Further, telephone lines with modems are used to transfer information from the set top terminal 220 to the statistical and billing sites.

## 5. Set Top Terminal

**[0067]** The set top terminal 220 is the portion of the delivery system 200 that resides in the home of a subscriber. The set top terminal 220 is usually located above or below the subscriber's television, but it may be placed anywhere in or near the subscribers home as long as it is within the range of the subscriber's remote control device 900. In some aspects, the set top terminal 220 may resemble converter boxes already used by many cable systems. For instance, each set top terminal 220 may include a variety of error detection, decryption, and coding techniques such as anti-tapping encoding. However, it will become apparent from the discussion below that the set top terminal 220 is able to perform many functions that an ordinary converter box cannot perform.

**[0068]** The set top terminal 220 has a plurality of input and output ports to enable it to communicate with other local and remote devices. The set top terminal 220 has an input port that receives information from the cable headend 208. In addition, the unit has at least two output ports which provide communications from the set top terminal 220 to a television and a VCR. Certain menu selections may cause the set top terminal 220 to send control signals directly to the VCR to automatically program or operate the VCR. Also, the set top terminal 220 contains a phone jack which can be used for maintenance, trouble shooting, reprogramming and additional customer features. The set top terminal 220 may also contain stereo/audio output terminals and a satellite dish input port.

**[0069]** Functionally, the set top terminal 220 is the last component in the delivery system chain. The set top terminal 220 receives compressed program and control signals from the cable headend 208 (or, in some cases, directly from the operations center 202). After the set top terminal 220 receives the individually compressed program and control signals, the signals are demultiplexed, decompressed, converted to analog signals (if necessary) and either placed in local storage (from which the menu template may be created), executed immediately, or sent directly to the television screen.

**[0070]** After processing certain signals received from the cable headend 208, the set top terminal 220 is able to store menu templates for creating menus that are displayed on a subscriber's television by using an array of menu templates. Before a menu can be constructed, menu templates must be created and sent to the set top terminal 220 for storage. A microprocessor uses the control signals received from the operations center 202 or cable headend 208 to generate the menu templates for storage. Each menu template may be stored in volatile memory in the set top terminal 220. When the set top terminal receives template information it demultiplexes the program control signals received from the cable headend 208 into four primary parts: video, graphics, program logic and text. Each menu template represents a different portion of a whole menu, such as a menu background, television logo, cursor highlight overlay, or other miscellaneous components needed to build a menu. The menu templates may be deleted or altered using control signals received from the operations center 202 or cable headend 208.

**[0071]** Once the menu templates have been stored in memory, the set top terminal 220 can generate the appropriate menus. In the preferred embodiment, the basic menu format information is stored in memory located within the set top terminal 220 so that the microprocessor may locally access the information from the set top terminal instead of from an incoming signal. The microprocessor next generates the appropriate menus from the menu templates and the other menu information stored in memory. The set top terminal 220 then displays specific menus on the subscriber's television screen that correspond to the inputs the subscriber selects.

**[0072]** If the subscriber selects a specific program from a menu, the set top terminal 220 determines on which channel the program is being shown, demultiplexes and extracts the single channel transmitted from the cable headend 208. The set top terminal 220 then decompresses the channel and, if necessary, converts the program signal to an analog NTSC signal to enable the subscriber to view the selected program. The set top terminal 220 can be equipped to decompress more than one program signal, but this would unnecessarily add to the cost of the unit since a subscriber will generally only view one program at a time. However, two or three decompressors may be desirable to provide picture-on-picture capability, control signal decompression, enhanced channel switching or like features.

**[0073]** In addition to menu information, the set top terminal 220 may also store text transmitted from the cable headend 208 or the operations center 202. The text may inform the subscriber about upcoming events, billing and account status, new subscriptions, or other relevant information. The text will be stored in an appropriate memory location depending on the frequency and the duration of the use of the textual message.

**[0074]** Also, optional upgrades are available to enhance the performance of a subscriber's set top terminal 220. These upgrades may consist of a cartridge or computer card (not shown) that is inserted into an expansion slot in the set top terminal 220 or may consist of a feature offered by the cable headend 208 or operations center 202 to which the user may subscribe. Available upgrades may include on line data base services, interactive multi-media services, access to digital radio channels, and other services.

**[0075]** In the simplest embodiment, available converter boxes such as those manufactured by General Instruments or Scientific Atlanta, may be modified and upgraded to perform the functions of a set top terminal 220. The preferred upgrade is a circuit card with a microprocessor which is electronically connected to or inserted into the converter



## 6. Remote Control Device

**[0076]** The primary conduit for communication between the subscriber and the set top terminal 220 is through the subscriber interface, preferably a remote control device 900. Through this interface, the subscriber may select desired programming through the system's menu-driven scheme or by directly accessing a specific channel by entering the actual channel number. Using the interface, the subscriber can navigate through a series of informative program selection menus. By using menu-driven, iconic or alpha-character access, the subscriber can access desired programs by simply pressing a single button rather than recalling from memory and pressing the actual channel number to make a selection. The subscriber can access regular broadcast and basic cable television stations by using either the numeric keys on the remote control 900 (pressing the corresponding channel number), or one of the menu icon selection options.

**[0077]** In addition to enabling the subscriber to easily interact with the cable system 200, the physical characteristics of the subscriber interface 900 should also add to the user friendliness of the system. The remote control 900 should easily fit in the palm of the user's hand. The buttons of the preferred remote control 900 contain pictorial symbols that are easily identifiable by the subscriber. Also, buttons that perform similar functions may be color coordinated and consist of distinguishing textures to increase the user friendliness of the system.

## 7. Menu-Driven Program Selection

**[0078]** The menu-driven scheme provides the subscriber with one-step access to all major menus, ranging from hit movies to sport specials to specialty programs. From any of the major menus, the subscriber can in turn access submenus and minor menus by cursor or alpha-character access.

**[0079]** There are two different types of menus utilized by the preferred embodiment, the Program Selection menus and the During Program menus. The first series of menus, Program Selection menus, consists of an Introductory, a Home, Major menus, and Submenus. The second series of menus, During Program menus, consists of two primary types, Hidden menus and the Program Overlay menus.

**[0080]** Immediately after the subscriber turns on the set top terminal 220, the Introductory menu welcomes the subscriber to the system. The Introductory menu may display important announcements from the local cable franchise, advertisements from the cable provider, or other types of messages. In addition, the Introductory menu can inform the subscriber if the cable headend 208 has sent a personal message to the subscriber's particular set top terminal 220.

**[0081]** After the Introductory menu has been displayed the subscriber may advance to the next level of menus, namely the Home menu. In the preferred embodiment, after a certain period of time, the cable system will advance the subscriber by default to the Home menu. From the Home menu, the subscriber is able to access all of the programming options. The subscriber may either select a program directly by entering the appropriate channel number from the remote control 900, or the subscriber may sequence through incremental levels of menu options starting from the Home menu. The Home menu lists categories that correspond to the first level of menus called Major menus.

**[0082]** If the subscriber chooses to sequence through subsequent menus, the subscriber will be forwarded to the Major menu that corresponds to the chosen category from the Home menu. The Major menus further refine a subscriber's search and help guide the subscriber to the selection of his choice.

**[0083]** From the Major menus, the subscriber may access several submenus. From each submenu, the subscriber may access other submenus until the subscriber finds a desired television program. Similar to the Major menu, each successive level of Submenus further refines the subscriber's search. The system also enables the subscriber to skip certain menus or submenus and directly access a specific menu or television program by entering the appropriate commands on the remote control 900.

**[0084]** The During program menus (including Hidden Menus and Program Overlay Menus) are displayed by the set top terminal 220 only after the subscriber has selected a television program. In order to avoid disturbing the subscriber, the set top terminal 220 does not display the Hidden Menus until the subscriber selects the appropriate option to display a Hidden Menu. The Hidden Menus contain options that are relevant to the program selected by the viewer. For example, a Hidden Menu may contain options that enable a subscriber to enter an interactive mode or escape from the selected program.

**[0085]** Program Overlay Menus are similar to Hidden Menus because they occur during a program and are related to the program being viewed. However, the Program Overlay Menus are displayed concurrently with the program selected by the subscriber. Most Program Overlay Menus are small enough on the screen to allow the subscriber to continue viewing the selected program comfortably.

## B. Operations Center With Computer Assisted Packaging System

**[0086]** Figure 4 broadly shows the configuration for the computer assisted packaging system (CAP) 260 of the Oper-

ations Center 202. The primary components of the CAP 260 consist of multiple packager workstations 262, a central processing unit 264, video/audio editing equipment 266, and one or more databases 268 and 269. Additional remotely located databases, such as local video storage database 267, and buffers 271 and controllers 272 for external program feeds make up the peripherals of the CAP system 260.

**[0087]** The heart of the CAP 260 is a central processing unit 264 which communicates with all the component parts of the CAP 260. The central processing unit 264 can be a powerful PC, a mini-computer, a mainframe or a combination of computing equipment running in parallel. The central processing unit 264 includes all the necessary interconnections to control peripheral equipment such as the external video controls 272. The central processing unit 264 has sufficient memory 274 to store the program instructions of the subroutines which operate the CAP 260.

**[0088]** The CAP 260 receives data from one or more databases, such as the Operations Center Database 268 and the Cable Franchise Information Database 269 shown in Figure 4. In addition, separate databases are maintained of viewer information, such as demographics and programs viewed. The CAP 260 can control the reception of external sources by enabling and disabling the external video controls 272. The external video controls 272 include buffers to delay as necessary external programs received by the Operations Center 202.

**[0089]** The functions of the video/audio equipment 266 include digitizing analog programs, digitizing and compressing analog programs (in a single step. e.g., MPEG), and compressing digital program signals as requested by the central processing unit 264.

**[0090]** The CAP 260 receives video and audio from two sources: internally from a local video storage 267 and externally from external sources through external video controls 272. When necessary, video is manipulated, formatted and/or digitized using video/audio equipment 266 which is controlled by CAP 264.

**[0091]** Referring back to Figure 2, an overview of an operating cable television menu driven program delivery system 200 highlighting various external programming signal sources 212 is depicted. The Operations Center 202 is shown receiving external programming signals which correspond to particular programming categories that are available for a subscriber's viewing. These external signals may be in analog or digital form and may be received via landline, microwave transmission, or satellite. Some of these external signals may be transmitted from the program source 212 to the Operations Center 202 in compressed digital format or other nonstandard digital formats. These external signals are received and packaged with programming that is stored at the Operations Center 202.

**[0092]** Example of external program sources 212 shown in Figure 2 are: Sporting events, children's programs, documentaries, high definition TV sources, specialty channels, interactive services, weather, news, and other nonfiction or entertainment. Any source that can provide either audio or video or both may be utilized to provide programming to the Operations Center 202.

**[0093]** In order to achieve the required throughput of video and audio information for the system, digital compression techniques are employed. A television signal is first digitized. The object of digitization is two-fold: First, in the case of an analog signal, like a television picture, digitization allows the signal to be converted from a waveform into a digital binary format. Secondly, through the use of digital compression techniques, standard digital formats are designed to have the resulting pictures or video stills take up less space on their respective storage mediums. Essentially, as described below, a standard digital format will define the method of compression used.

**[0094]** There are three basic digital compression techniques: within-frame (intraframe), frame-to-frame (interframe), and within-carrier. Intraframe compression processes each frame in a television picture to contain fewer visual details and, therefore, the picture contains fewer digital bits. Interframe compression transmits only changes between frames, thus omitting elements repeated in successive frames. Within-carrier compression allows the compression ratio to dynamically vary depending upon the amount of changes between frames. If a large number of changes occur between frames, the compression ratio drops from, for example, sixteen-to-one to eight-to-one. If action is intense, the compression ratio may dip to four to one.

**[0095]** Several standard digital formats representing both digitizing standards and compression standards have been developed. For example, JPEG (Joint photographic experts group) is a standard for single picture digitization. Motion picture digitization may be represented by standards such as MPEG or MPEG2 (motion picture engineering group specifications). Other propriety standards have been developed in addition to these. The preferred embodiment uses the MPEG-2 standard of coding and those of ordinary skill in the art are presumed to be familiar with the MPEG-2 standard. The MPEG-2 Systems Working Draft Proposal from the Systems Committee of the International Organization For Standardization, document ISO/IE JT1/SC29/WG11 "N0531" MPEG93 dated September 10, 1993, is hereby incorporated by reference. Although MPEG and MPEG2 for motion pictures are preferred in the present invention, any reliable digital format with compression may be used with the present invention.

**[0096]** Various hybrids of the above compression techniques have been developed by several companies including AT&T, Compression Labs. Inc., General Instrument, Scientific-Atlanta, Phillips, and Zenith. As is known by those skilled in the art, any of the compression techniques developed by these companies, and other known techniques, may be used with the present invention.

**[0097]** With reference to Figure 4, the human intervention in this system is conducted by a programmer or program

packager operating from the one or more work stations 262 connected to the system. These work stations 262 are preferably intelligent work stations with large CRT screens. In the preferred embodiment, a suitable keyboard, mouse and color monitor are used with the workstation. From these work stations, the packager can create program lineups, prioritize programs, initiate dynamic menu allocation, initiate dynamic bandwidth allocation, design menus, place program names and descriptions onto menus, create menus with still and live video, move text on menus, change the colors of objects on menus and perform various other tasks for the program delivery system 200.

**[0098]** Almost any Operations Center 202 function that normally requires human intervention can be conducted at the packager workstation 262. Although data entry for the databases can be performed manually at the workstations 262, it is preferred that the data entry be completed through electronic transfers of information. Alternatively, the data can be loaded from customary portable storage media such as magnetic disks or tape.

**[0099]** An integral part of the Computer Assisting Packaging system is the retrieval of viewer data, and the assimilation of that data into the program packaging method (especially the menu configuration) as discussed in reference to Figure 8 MII 402. This involves two main steps, first, retrieval of raw data from the set top terminals, and then filtering and presenting that data. Each headend 208 compiles the viewer data, and then sends it verbatim to the Operations Center 202. This raw data is necessary because different responsibilities of the Operations Center 202 require different parts of the raw information. Also a record must be kept of overall data. Once the data is assembled at the Operations Center 202, the data is filtered for each application.

**[0100]** The raw data gathered includes but is not limited to:

- What programs a viewer purchased and when it was purchased
- What channel a specific viewer watched and for how long.

**[0101]** This information can then be used to calculate the following:

- How many viewers watched a particular program.
- Peak viewing times for different categories of shows.
- Buy rates for particular menu positions.

**[0102]** Menu creation, both automatically and manually, is one of the major CAP functions that involves the incorporation of the raw data. An automated software procedure (such as the EIS) analyzes the data and, using certain heuristics, creates the menus.

**[0103]** One heuristic, for example, is that when a show is not ordered frequently, it is moved closer to the top of the menu for greater visibility. The filtering of the data allows it to be sorted and indexed for display to the user. The program data can be filtered into a new database containing program names and indexed by the number of times each program was purchased. The data can also be indexed by buy times and program categories.

**[0104]** Certain metrics are established to help in evaluating the data. Using the EIS or similar software, sales by menu placement, cost, category and lifespan can be pulled up for viewing in graphic presentation. The graphic presentation, in the form of line or bar graphs, help the packager recognize any trends in the data. For example, the first movie on a movie menu might not have sold as well as a second movie listed. A chart can be pulled up to reveal that the first movie has been at the top of the menu for two weeks and buy rates are naturally falling off. Steps can then be taken to move items in the menus to correct this, though many of these steps are automated in the main creation system. Suggested changes can be displayed to help the user in this task.

**[0105]** The automated procedures create menus that are distinct between headends 208 because of demographic differences in the viewing audience. To help with this, a separate database of viewer demographics exists and is frequently updated. The headends 208 are able to alter the menu positions in order to further tailor the presentation, or to add local shows. Any changes to the menus are sent back to the Operations Center 202 at the same time as the viewer data, in order to prevent erroneous data analysis. Menu changes at the cable headend are described in detail in co-pending patent application Ser. No. \_\_\_\_\_, entitled Network Controller for a Cable Television System, filed by the same assignee.

**[0106]** Another use for the indexed data is creation of marketing reports. Programming changes are helped by accurate information on viewer preference. Also viewer purchasing trends, and regional interests can be tracked.

**[0107]** In the preferred embodiment, an Executive Information System (EIS) is used to give high level access to both "buy" (what the customer purchases) and "access" (when the product was viewed, how often and duration) data. The EIS represents information in both a graphical and summary report format. "Drill down" functions in the EIS help the packager derive the appropriate product (product refers to programs, events or services) mix.

**[0108]** The purpose of the EIS is to provide an on-line software tool that will allow for real-time evaluation of current product positioning. The design of the system consists of user friendly icons to guide the user through available functions. The functionality in the system provides general information on current programming sales status. By working

through the tiers in the system, the user has access to more specific information. The system is designed to shield the user from a long learning curve and information overload.

[0109] The graphical tools allow for analysis of current data through the use of multiple graph types such as line graphs, bar and pie charts. These tools will allow the user to manipulate independent variables such as time (hour, day of the week, week, month), demographic information, program category information (genre, property, events), headend information and pricing information for determining the appropriate programming mix within the allotted time slots.

[0110] The system also allows the packager to derive expected monetary returns through program line-ups by integrating outside industry databases. For instance, the system could be used to determine expected returns from a particular program by correlating buy information from the existing programs in the line up with a viewer ratings service database to determine the outcome of programs within a particular genre not in the current line up.

[0111] Report tools within the EIS aggregate buy access at the highest level. Due to the volume of available information statistical analysis methods are used for deriving marketing intelligence within the EIS.

[0112] A yield management tool is incorporated within the EIS. The yield management tool encompasses operations research techniques, statistical methods and neural net technology to decide program mix as it pertains to program substitutes, program complements, time slice positioning, repetitions and menu positioning.

[0113] This system is automated to the extent of providing viable alternative as to the proposed product mix. The system encompasses a Monte Carlo simulation for developing alternative product mix scenarios. The system feeds from both internal data and external industry data sources to provide expected revenue projections for the different scenarios. Other software subroutines of the CAP will automatically call upon the EIS to assist the program in important decision making, such as menu configuration and transponder allocation. Human interaction is required to change marketing parameters for fine tuning the desired product scheduling.

[0114] Although the packaging of the program information and programs, including the creation of program control information, program lineup and menu designing configuration, is conducted at the CAP 260, all other functions of the Operations Center 202 can be controlled by a second separate processing unit (shown in Figure 5 at 270). This second processing unit 270 is the Delivery Control Processing Unit 270, and can perform the tasks of incorporating the program control information signal from the CAP 260, coordinating the receipt and combining of external program video/audio and internal video/audio and combining the signals as necessary for transmission. This distribution of functions among the CAP 260 and Delivery Control Processing Unit 270 allows for greater speed and ease of use.

[0115] Figure 5 shows a more detailed diagram of the CAP 260 and the Delivery Control Processor Unit 270. Once external and stored digital and analog sources have been converted into a standard digital format 274, they are input into standard digital multiplex equipment 273 (of the type manufactured by Scientific Atlanta, General Instruments, and others). Additionally, the Program Control Information Signal 276 is input into the digital multiplex equipment 273. These inputs 274, 276 are multiplexed appropriately under the control of the Delivery Control Processor Unit 270 as commanded by the CPU 264. The Delivery Control Processor Unit 270 is also responsible for the generation of the Program Control Information Signal 276 based on information received from the CPU 264. The Delivery Control Processor Unit 270 allows for the off-loading of real-time and near real-time tasks from the CPU 264. The CPU 264, as described earlier, processes information within its database and provides user access to the CAP 260 via multiple user workstations 262. The high-speed digital output 278 from the digital multiplex equipment 273 is then sent on to the compression (if necessary), multiplexing, modulation and amplification hardware, represented at 279.

### C. The Program Control Information Signal

[0116] The following table, TABLE A, is an example of some information that can be sent in the program control information signal to the set top terminals 220. The program control information signal generated by the Operations Center 202 provides data on the scheduling and description of programs via the network controller 214 or, in an alternate configuration, directly to the set top terminal 220 for display to the subscriber.

[0117] In the preferred embodiment, the program control information signal 276 is stored and modified by the network controller 214 and sent to the set top terminal 220 in the form of a set top terminal control information stream (STTCIS). This configuration accommodates differences in individual cable systems and possible differences in set top converter or terminal devices. The set top terminal 220 of the present invention integrates either the program control signal 276 or the STTCIS, together with data stored in the memory of the set top terminal 220, to generate on-screen menu displays for assisting the subscriber in choosing programs for viewing. (Throughout the description the term "program control information" is being used to indicate control information coming from the cable headend 208 to the set top terminal 220, whether it is sent directly from the Operations Center 202, processed by the network controller 214, and then forwarded to the set top terminal as STTCIS, or transmitted over telephone lines.)

[0118] With further reference to TABLE A below, the types of information that can be sent via the program control signal include: number of program categories, names of program categories, what channels are assigned to a specific category (such as specialty channels), names of channels, names of programs on each channel, program start times,

length of programs, description of programs, menu assignment for each program, pricing, whether there is a sample video clip for advertisement for the program, and any other program, menu or product information.

[0119] The goal of the menu driven program selection system of the present invention, described in greater detail in a co-pending U.S. Patent application entitled SET TOP TERMINAL FOR CABLE TELEVISION DELIVERY SYSTEM, Ser. No. \_\_\_\_\_, owned by the assignee of the present invention and incorporated herein by reference, is to allow the subscriber to choose a program by touring through a series of menus utilizing a remote control 900 for cursor movement. The final choice in the series of menus will identify one particular channel and one time for activation of that channel. Armed with a channel and activation time the set top terminal 220 can display the selected program on the television for the viewer. To achieve this goal, an intelligent alpha-numeric code is assigned to each program. This alpha-numeric code identifies the category of the program, the menu in which the program should be displayed, its transmission time(s), and the position on the menu that the program should be displayed. In a preferred embodiment, the program control information, including menu codes, is sent continuously from the Operations Center 202 to the network controller 214, and ultimately to the set top terminal 220. For example, four hours worth of programming information can be sent via the program control information signal continuously in the format shown in TABLE A.

TABLE A

12:00 PM					
*Program name		*Program length	*Menu code	*Description	*Video
1	Cheers	.5	E24	C	N
2	Terminator	2.0	A33	Tx	S
3	PrimeTime	1.0	D14	N	N
4	Football Special	.5	B24	S	N
.					
.					
.					
.					
12:30 PM					
*Program name		*Program length	*Menu code	*Description	*Video
1	Simpsons	.5	E14 & C13	C	S
4	Football Game	3.0	B13	S	N
.					
.					
.					

[0120] TABLE A shows the basic information that is needed by the set top terminal 220. The program descriptions shown are coded abbreviations. For example, C stands for comedy, N for news, S for sports, A for cartoons, and TX for text. If there is a textual description for a program, such as a movie, the description may be given following that program's coded description or may be communicated following the four hours of programming information. As is shown in the coded listing, program descriptions for programs greater than a half hour in length need not be repeated (each half hour). The video description code informs the set top terminal 220 whether there is still or live video available to advertise the program.

[0121] For example, a sporting program may be assigned a code of B35-010194-1600-3.25-Michigan St. vs. USC. The letter B could assign the program to category B, sports. The second alpha-numeric character number 3 would assign the program to the third menu of the sports category. The third character of the code, number 5, assigns the program to the fifth program slot on the third menu. The next six characters, 01/01/94, represent the date. The following four characters, 1600 represent the sort time which is followed by the length of the program and the program name. This entry represents a sports show, a college football game, which will be aired at 4:00PM on New Years day 1994.

[0122] In the 12:30 Channel 1 entry of TABLE A, two menu codes are shown. By allowing two main codes, programs that may fit under two different category descriptions may be shown in both menus to the subscriber. With this minimal

amount of information being communicated to the set top terminal 220 on a regular basis, the terminal is able to determine the proper menu location for each program and the proper time and channel to activate for the subscriber after his menu selection. In the preferred embodiment, the menu codes are generated at the Operations Center 202.

[0123] Table B shows an example Events Table that may be downloaded to a set top terminal 220 using the Event Data file which contains information about events and pricing. As shown in the table, the three columns of the Events Table identify the field number, the field itself and the type of information downloaded in the Event Data file. The first column contains the field numbers 1 through 11. The middle column contains the corresponding field parameters, including the event type, event ID, global channel ID, price, start time, end time, start date, end date, P- icon, name and description. The third column contains corresponding field type information. As shown in this field type information typically consists of an unsigned integer; hours, minutes and seconds; months, day and year; and ASCII character identifier.

TABLE B

Field #	Field	Type
1	Event Type 1 = YCTV 2 = Pay-Per-View 3 = Reg. TV	Unsigned Int
2	Event ID	Unsigned Int
3	Global Channel ID	Unsigned Int
4	Price (in Cents)	Unsigned Int
5	Start Time	HH:MM:SS
6	End Time	HH:MM:SS
7	Start Date	MM/DD/YY
8	End Date	MM/DD/YY
9	P-Icon	ASCIIZ
10	Name	ASCIIZ
11	Description	ASCIIZ

[0124] Table C shows an example Event Data data file. In particular, Table C shows two data streams corresponding to two event types. The first data stream identifies a YCTV event in the first field. The second field designates the event ID, which is 1234 in this example. The third field includes the global channel ID number two. The fourth field indicates the cost of 50 cents for this event. The fifth and sixth fields indicate the respective start and end times of 3:00 a.m. to 3:00 p.m., respectively. The seventh and eighth fields show the corresponding start and end date, designated as 8/25/93 and 8/27/93, respectively. Field nine indicates the P icon set to a graphics file. Finally, fields ten and eleven indicate the name and description of the event selected, which in this case is Sesame Street™ and Barney™. The second data stream in the Event.Dat example shown in Table C includes analogous information for Terminator IV™, which is designated in field one as a pay-per-view event.

TABLE C

**Event Data Example**

1	1234	2	50	03:00:00	15:00:00	08/25/93	08/27/93	pba.pcx	Sesame Street & Barney's	Sesame Street and Barney Abstract
2	1234	2	50	20:00:00	22:00:00	08/25/93	08/25/93	t4.pcx	Terminator 4	Terminator 4 Abstract

[0125] The program control information signal 276 and STTCIS can be formatted in a variety of ways and the on-

screen menus can be produced in many different ways. For instance, if the program control information signal 276 carries no menu format information, the main format for creating the menus can be fixed in ROM at the set top terminal 220. This method allows the program control signal 276 to carry less information but has the least flexibility since the menu formats cannot be changed without physically swapping the ROM holding the menu format information. In the preferred embodiment, the menu format information is stored at the set top terminal 220 in temporary memory either in a RAM or EPROM. This configuration provides the desired flexibility in the menu format while still limiting the amount of information needed to be communicated via the program control information signal 276. New menu format information would be sent via the program control information signal 276 or the STTCIS to the set top terminals 220 each time there was a change to a menu.

**[0126]** In the simplest embodiment, the menus remain fixed and only the text changes. Thus, the program control information signal 276 can be limited to primarily text and a text generator can be employed in the set top terminal 220. This simple embodiment keeps the cost of the set top terminal 220 low and limits the bandwidth necessary for the program control information. Another simple embodiment uses a separate channel full-time (large bandwidth) just for the menu information.

**[0127]** Figures 6a and 6b, particularly Figure 6a, show a data format 920 at the bit-level for one embodiment of a program information signal 276. This frame format consists of six fields, namely: (1) a leading flag 922 at the beginning of the message, (2) an address field 924, (3) a subscriber region designation 926, (4) a set top terminal identifier 928 that includes a polling command/response (or P/F) bit 930, (5) an information field 932, and (6) a trailing flag 934 at the end of the message.

**[0128]** The eight-bit flag sequence that appears at the beginning 922 and end 927 of a frame is used to establish and maintain synchronization. Such a sequence typically consists of a "01111110" bit-stream. The address field 924 designates a 4-bit address for a given set top terminal 220. The subscriber region designation 926 is a 4-bit field that indicates the geographical region in which the subscriber's set top terminal 220 is housed. The set top terminal identifier 928 is a 16-bit field that uniquely identifies each set top terminal 220 with a 15-bit designation followed by an appended P/F bit 930. Although field size is provided by this example, a variety of sizes can be used with the present invention.

**[0129]** The P/F bit 930 is used to command a polling response 920' (Figure 6b) from the set top terminal 220 addressed. The polling response 920' is substantially similar to the from format 920, and is commonly numbered, but with a prime (') designation appended for clarity. The frame format 920 also provides a variable-length information field 932 for other data transmissions, such as information on system updates. The frame format ends with an 8-bit flag 934 (or trailing flag) that is identical in format to the leading flag 922, as set forth above. Other frame formats, such as MPEG, for example, will be apparent to one skilled in the art and can be easily adapted for use with the system.

#### D. Software Subroutines

**[0130]** The program control information signal 276 is produced substantially by the CAP CPU 264 and the Delivery Control Processor Unit (DCPU) 270. An overview of the software modules, focusing on the processing of signals and communication between CAP CPU 264 and DCPU 270 is shown in Figure 7. The software modules for the CAP CPU 264 and DCPU 270 include dispatcher 484, processing 486 and communications 488, each of which performs like-named functions, as well as supporting database 490 access. Processing within the CAP CPU 264 is controlled by the dispatcher 484 software module which may generate processing commands based on user command (e.g., do something now), schedule events (e.g., do something at noon) or based on the occurrence of other events (e.g., do something when the database is updated). The dispatcher 484 sends messages to the processing software module 486 instructing it to process information within the database 490 and generate control information for the DCPU 270. For example, based on the updating of information associated with a particular headend 208, the dispatcher 484 may command the CAP CPU 264 to regenerate headend 208 parameters, perform any required database integrity checking and send them to the DCPU 270. Also, in the case of headend 208 information processing, a filtering function (not shown) is performed which eliminates any information that does not either directly or indirectly relate to a given headend 208. Information transfer between the CAP CPU 264 and the DCPU 270 is controlled by the DCPU communications software module 488.

**[0131]** Information received by the DCPU 270 from the CAP CPU 264 is processed at the DCPU processing module 496 and put into a form consistent with the DCPU 270. Some of this information is used for DCPU control, while most is data to be integrated into the program control information signal 261. Some of this information is also used for miscellaneous control 494 for such things as external multiplex equipment, source material generation hardware, transmission equipment and so on. Information destined for the program control information signal 261 may be transmitted once or may be scheduled for periodic transmission. This information is integrated by the processing module 496 with other information, both internal and external. The DCPU scheduler module 497 is responsible for scheduling and regulating this data traffic. Also, the scheduler 497 may perform information filtering. For example, imbedded date/time information within the information records of interest can be used for filtering. External pass-through control information 495 may

also be incorporated into the program control information signal 261 to provide external input to this digital data stream. The DCPU multiplexer 498 is responsible for multiplexing external pass-through control information. Finally, a transmission software module 499 in conjunction with appropriate communications hardware (not shown), controls the output of both the program control information signal 261 and the miscellaneous control signals 494.

5 **[0132]** Figure 8 is a high level diagram of CAP software subroutines and their interrelations. A Main Program (not shown) orchestrates the use of the various subroutines as needed to perform the CAP's tasks. The Packager Data Entry Interface (PDEI) 400, Marketing Information Interface (MII) 402, and Cable Franchise Information Access (CFIA) 404 subroutines perform the interface functions between the CAP Main Program and outside data or information. The remaining subroutines shown in the center column of Figure 8 perform the processing and manipulations necessary to the functioning of the CAP 260.

10 **[0133]** The Packager Data Entry Interface (PDEI) 400 subroutine includes routines that enable the Packager to interactively enter program selections 410, start times of programs 412, price setting 414, transponder allocation 416, and main editing 418. The PDEI subroutine 400 controls the keyboard and mouse data entry by the packager and runs in concert with the processing and editing subroutines described later.

15 **[0134]** The Marketing Information Interface (MII) 402 subroutine interfaces the processing and editing subroutines with marketing data. This interface regularly receives programs watched information from billing sites 420, cable headends 208, or set top terminals 220. In addition, other marketing information 422 such as the demographics of viewers during certain time periods may be received by the MII 402. The MII 402 also uses algorithms 424 to analyze the program watched information and marketing data 420, 422, and provides the analyzed information to the processing and editing subroutines. In the preferred embodiment, an Executive Information System (EIS) with a yield management sub-system is included in the MII subroutine as described above.

20 **[0135]** The Cable Franchise Information Access (CFIA) 404 subroutine receives information on cable franchises, as represented at block 426, such as the particular equipment used in a cable headend 208, the number of set top terminals 220 within a cable franchise, groupings of set top terminals 220 on concatenated cable systems 210, distribution of "highend" cable subscribers, etc. The CFIA 404 generates a cable franchise control signal 428 which is integrated with the program control information 276 output to generate cable headend 208 specific information to be transmitted. The integration algorithm for accomplishing this resides within the Generator subroutine described herein below.

25 **[0136]** The process program line-up subroutine 430 uses information from the MII 404 and PDEI 400 to develop a program line-up. Importance weighting algorithms and best fit time algorithms are used to assign programs in time slots.

30 **[0137]** The process menu configurations subroutine 432 determines appropriate menu formats to be used and positions programs on menu screens. Information from the MII 404 and PDEI 400 are used to determine program positions on menus.

**[0138]** The menu display algorithms 434 displays menus as the menus would be seen by the viewer on a large CRT or color monitor.

35 **[0139]** The editing of menus subroutine 436 works with the menu display algorithm and PDEI 400 to allow the packager to edit menus on-the-fly during viewing of the menus.

**[0140]** The graphical transponder allocation display 438 sends information obtained from the CFIA 404 and PDEI 400 to create graphical displays enabling the packager to comprehend the allocation of transponder space across the entire television delivery system 200.

40 **[0141]** In a manner similar to the display and editing of menus represented at blocks 434, 436, the packager may utilize the editing transponder allocation subroutine 440 to interactively reallocate assignment of transponder space. In the preferred embodiment, the EIS with yield management may be used by the packager to assist in decisions on allocating transponder space.

45 **[0142]** The generator subroutine 442 creates the program control information signal for output. The Generator subroutine receives the cable franchise control signal and uses this signal to help create a custom signal for each cable headend 208.

**[0143]** The Packaging Routine 448 obtains and packages the programs, along with the program control information signal 216, for transmission to the transponders.

50 **[0144]** With continued reference to Figure 7, 8 and 9, the general software flow of the operations center 202 is depicted. The flow can be broken up into modules that apply to parts of the database to allow viewing, editing, and adding records to the database. The software also accomplishes database integrity checking by restricting the user to enter only valid data, and by checking for conflicts.

55 **[0145]** Figure 9 shows some of the software involved in the creation of programs, events and services. This creation occurs prior to or during the processing of the program line-up 430 shown in Figure 8. With reference to Figure 9, a first step is indicated generally at 461 and includes acquiring source materials for program production at the Operations Center 202 (e.g., tape production). Once the source materials are collected 460, and entered into the database "D", they can be used to create programs 462. These programs are made up of source 'cuts' from various video/audio



source materials. Once the programs have been generated and entered into the database "D", events, collections of one or more programs, are created 464. Each event is then schedule onto a service 466, with the software checking for conflicts. Each service is given run times, and days, and checked for conflicts. Once the services and events have been created, the event names can be added to the menus 468. The programs for the events and services may be stored at the Operations Center (as shown in Figure 11 at 286). Processing and manipulation of the events or records is depicted generally at 463.

**[0146]** The packager user interface (a portion of 463) for each of the creation modules works substantially identically to each of the other modules to make the interface easy to use and learn. The packager user interfaces forms a portion of the PDEI 400 shown on Figure 8. The browse system 470 is entered first and allows viewing of records, and selection of specific records. The database can be 'populated' by selection of a button, which activates a populate screen. As represented at block 471, this allows details to be deleted, added or changed for events, programs, and sources. The browse screen also allows access to the edit screen 472, where fields in a selected record can be modified, with conflicts or errors, in scheduling for example, being checked continuously, as at 473 and 474.

**[0147]** In use, the Operations Center 202 of the present invention performs a variety of management functions which can be broken out into five primary areas: (1) cable headend 208 management, (2) program source management, (3) broadcast program management, (4) internal program storage and management, and (5) marketing, management and customer information. A relational database, such as that represented by Figure 10, can be used to maintain the data associated with these areas.

**[0148]** Customer billing is not included in any of the above five areas for the Operations Center 202. Although billing can be handled by the Operations Center 202 (as shown in the database structure 508, 511), it is preferred that billing is handled at a remote location through traditional channels and methods (such as Cable TV billing provided by Tel-e-corp corporation). Extracts of customer purchases will be provided to the Operations Center 202. These extracts of information will be formatted and correlated with customer demographics for marketing purposes by the Marketing Information Interface (MII) 402.

#### (1) Cable Headend Management

**[0149]** Management of the cable headend 208 includes the following activities: defining the cable headend site; profiling the viewers; determining available set top equipment; defining the concatenated cable systems connected to the cable headend site. This information may be stored as cable franchise information within the Operations Center 202 database by the Cable Franchise Information Access routine 404. Such information can be compiled and maintained in a relational database (described below and shown as 328 in Figure 11).

#### (2) Program Source Management

**[0150]** Source programs will be provided by a variety of networks. Information from the contractual records to the actual program tapes should be maintained and includes: tracking of property rights; tracking and profiling source tapes; profiling source providers. A relational database (such as "D" shown in Figure 9) can be used, for example that identifies and correlates programs sources. Programs may be received from various rights holders, and such a database would track the person or entity that owns the rights to each program at issue. Other data could be maintained relating to program cuts (a program cut is a portion of a program) that specifies, for example, the program from which the cut is taken. Information relating to time slot allocations, menu entries, and categories, and channel assignments are also maintained in the relational database.

**[0151]** Program services represents a purchasable time slice which is occupied by a type of programming. Each time slice has multiple time constraints. Using the purchasing of through time slices allows for great flexibility. An infinite number of program and time slice combinations are possible. Preferably, services are created using the software shown in Figure 9, particularly the service creation routine 466. For a service to become available at a cable headend 208 site. It is mapped to the site. At the time of mapping the program service is assigned a program channel.

**[0152]** Program services are defined by the following fields:

Service ID	System generated unique ID
Description	Describes the service. The description will allow the packager to easily assign a service to a broadcast program.
Type	Defines the type of service. Current service types include YCTV™, Grid, Network and Other.
Network ID	Relevant for network services. (examples: ABC, NBC, DISC™)
Broadcast Event	Relevant for a YCTV™ service. Identifies the current YCTV™ broadcast event assigned to the service.
PICON File	Name of the picture icon (PICON) assigned to the service. This picon is displayed for example on

the buy screen for a pay per view event.

Expiration Date	Expiration date of the service. Removes the service from the service selection list.
Day Start	Each service is a series of days within a week. This represents the starting day. (example: Monday)
Day Stop	Represents the last day in the interval.
5 Time Start	Within a day, the service has a time period. This field represents the start of the period.
Time Stop	Represents the end of the time period.
Required Tape	If stored tapes are required, the number of tapes required by the service.

### (3) Broadcast Program Management

**[0153]** Broadcast program management is one focal point of the data management system, The issues of product, price, promotion and packaging are addressed at this level. Decisions in these areas will affect the actual programming that will be shown to the viewers. Information on description of the content of each program event, program scheduling, broadcast program pricing, TV/set top information flow and information on how broadcast programs will be mapped to viewer channels should be included in the database. Preferably, the EIS system described below will access this data and assist in the Broadcast Program Management.

### (4) Internal Program Management

**[0154]** Information on internally stored programs at the Operations Center 202 should also be maintained. This will allow the Operations Center 202 to assemble electronically stored programs, CD stored programs and program tapes, and ensure the quality of programs and location of programs.

### (5) Marketing and Customer Information

**[0155]** Last, and important, marketing and customer information should be maintained. In order to effectively manage the operations, information is constantly needed on market conditions. Information is needed on the existence of markets for certain programs. The following type of information must be maintained in a Marketing and Customer information data base: demographic profile of viewers, viewer buy information; correlation of demographic information with buy information, information rapid restructuring of program mix in response to data analysis. As a subscriber uses the system, this viewer information or viewer log data can be stored and maintained in relational database. The Marketing Information Interface 402 gathers the marketing information and indexes the information for inclusion in the Marketing and Customer Information database. An example of the type of information that is needed in this data base is a viewer profile.

**[0156]** The viewer profile data fields are an example of typical fields required in the databases. Definitions of various fields are listed below. The primary purpose of profiling the viewer is to acquire marketing information on the viewer's response to available selections. Ancillary information will be available including the actual program and channel selections of the viewer. Information tracked within the viewer's profile includes:

40 Viewer ID	A unique identifier generated by the system.
Set-Top Types	Boolean field which identifies the type of set top used.
Headend ID	Links the viewer to a particular cable site.
Site Assigned ID	Viewer ID assigned by the cable site.
Set-Top ID	ID of the viewer's set top.
45 Hookup Date	Date physical hardware is connected.
Survey Date	A demographic profile will be conducted on each user. The following fields represent this demographic information. The data represents when the interview survey was completed.
Viewers Age 2-5	Boolean field if the household has viewers between 2 and 5 years of age.
Viewers Age 6-11	Boolean field if the household has viewers between 6 and 11 years of age.
50 Viewers Age 12-17	Boolean field if the household has viewers between 12 and 17 years of age.
Tape Rental \$	Approximate amount spent on tape rentals on a monthly basis.
PPV \$	Household average pay-pre-view expenditures per month.
Income	Annual household income.
Zip Code	Self-explanatory.
55 Cable Tier	Level of cable service purchased.
Number of TV's	Self-Explanatory.
Years with Cable	Self-Explanatory.
Occupancy	Number of people in household.

Highest Education    Highest level of education of any member of the household.

**[0157]** The compilation of viewer demographic information has an impact on decisions based on marketing. The names of the heads of household are not used due to Privacy Act considerations. Completion of demographic data can be accomplished referencing the cable site assigned ID or the system generated ID. There are numerous variations to the field definitions listed above such as different age groupings.

**[0158]** To maintain the database at the Operations Center 202, a data base server, communications server, user work station or stations 262, or the suitable equivalent thereof, are needed. The database server performs the following functions: it is the repository for data base files, event logging, event scheduling (example, automated download of files to headends 208), multi-user services, data base server services, and data base security access.

**[0159]** The communications server performs the following functions on data base data: integrity check, filtering, processing, downloading to headends 208, uploading from headends 208, and uploading from remote location.

**[0160]** User work stations 262 perform the following tasks: creation, deletion and access of all database data, system administration and report generation. Database manipulations are performed through the user workstations or remotely. The database structure is designed to support multiple users performing multiple tasks simultaneously. The preferred embodiment includes a network of user workstations 262. The workstations 262, through user interface software, access data within database files on the database server.

**[0161]** For example, once the appropriate database data has been generated for downloading to a cable headend 208, the communications server is instructed to perform the download. Although this may be done manually at the communications server, it is preferred that the communications server automatically send information to the cable headends 208. The communications server retrieves required data from the database server, filters out any data not associated with the specified headend 208, and performs data integrity checks, creates data files to be downloaded and then downloads the data file via modem (or other means such as the DCPU 270). While the communication server is connected with the headend 208, it also requests any data that the headend might be holding for the Operations Center 202. This may consist of cable headend 208 event log information, set top billing and viewer log data on programs watched, etc.

**[0162]** The communications server may also assist in retrieving information from other remote sites such as remote billing and statistic sites. For example, if a location is being used for billing purposes, the communications server may retrieve viewer log data. Also, the communications server may retrieve billing and viewer log data from actual set top converters in the field. Once the data is retrieved it is sent to the database server. Thus, in the preferred embodiment the communications server will support incoming information via modem or otherwise.

**[0163]** The basic database structure at the Operations Center 202 consists of multiple tables. Database data tables contain one or more data records, each with multiple fields. Each field contains a piece of data about the particular record. This data may be general information, such as a numeric value, date or text string, or it may be a reference to another database record relating one piece of data to another. Database index files contain information about associated data files to allow for improved data retrieval. The database index file makes retrieval of information much quicker.

**[0164]** In a alternative embodiment where some television programming begins with the procurement of source material in the form of tapes or CDs, additional data about the tapes or CDs may be stored in the Operations Center database. Each tape or CD may have a database record associated with it, source tape data file. Each tape may contain multiple cuts of which each cut has an associated record in a source tape detailed data file. Additionally, a company data file may contain individual records for the rights of the holders of the source tapes as well as company information about cable headends 208. In this alternative embodiment with tapes, programs may be created from multiple tapes using multiple tape source cuts. The programs created by these source cuts may be stored and the individual cuts that make up the programs may be stored in a database record called "program tape detail." Events may be created that consist of more than one program and details on individual programs that make up these events may be stored in a database file called "event detail." Using this embodiment, events may be sold to subscribers.

**[0165]** Figure 10 and the description below is a more complete example of a database structure that can be used with the present invention. Each database file is listed below along with a description, record field details and explanation of relationships. The software data structures are defined after the description of the database structure.

**[0166]** The SCHEDULE Database file 501 contains scheduling data for a single day. There are many schedule files, one for each day of schedule information. The actual filename for a given days schedule is assigned under computer control. Schedules are broken up into single days so they may be easily created, dispatched and archived. A cross-reference of days to computer generated filenames is kept. Each scheduled event (either a program or a preview) has its own record entry and unique schedule ID This record references the corresponding scheduled program or preview and program type (either program or preview). The service to carry the scheduled program is also referenced. The starting date and time is also specified. Program duration is stored as a program attribute and is not included here. Note that program, preview and service records must be provisioned before they may be referenced in a schedule record.

**[0167]** Another SCHEDULE Database file 500 contains a cross-reference of stating dates data to computer generated

filenames.

**[0168]** The PROGRAM Database file 502 contains Program records are contained in another database file 502, with each record representing a source program. Each program has a unique program ID. If the program has a corresponding preview, it is also referenced. Program category and price are also referenced. The structure of the program category database may be modified if multiple categories per program are desired. Program name, description and duration are also given. Note that preview, program category and price category records must be provisioned before they may be referenced in a program record.

**[0169]** The SERVICE Database file 503 contains service records with each record representing an available service. A service may be thought of as a virtual video channel. Virtual channels are non-existent channels which are mapped or created by hardware and software and is described in co-pending patent application Ser. No. \_\_\_\_\_, entitled ADVANCED SET TOP TERMINAL FOR A CABLE TELEVISION DELIVERY SYSTEM, incorporated herein by reference. Services are then mapped into local headend channels. Since initial distribution of video source material may be by "Federal Express" instead of a video channel, a service ID is used to identify the virtual channel being used for the desired service. "60 Minutes" could be distributed and then be mapped into any desired local headend channel.

The service database exists at both the national site and at each local headend 208. Every service has a name, call letters and a description of the service. Every service also has an assigned local channel. "A" tape (or CD) machine ID and "B" tape (or CD) machine ID. Note that these last three parameters only apply to the service databases at the local headends 208. The local headend service database performs an equivalent function of a "channel map." For a further description of the cable headend function, see co-pending patent application Ser. No. \_\_\_\_\_, entitled NETWORK CONTROLLER FOR A CABLE TELEVISION DELIVERY SYSTEM, filed by the same assignee.

**[0170]** The PREVIEW Database file 504 contains preview records with each record representing a source preview. A preview is like a program that is scheduled and distributed over a service. It differs from a program in that multiple previews may be distributed over the same service at the same time. Also, previews are free. Each preview specifies its location on the TV screen. This is generally done by selecting from a menu of valid screen positions. Unlike programs, previews do not reference program and price categories or other previews.

**[0171]** The PROGRAM CATEGORY Database file 505 contains program category records with each record representing a valid program category. Examples of program categories are movies, sports, educational and news. Multiple program categories per program may be accommodated if desired with simple changes to the database structure.

**[0172]** The PRICE CATEGORY Database file 506 contains price category records with each record representing a valid price category. Price categories are used to provide pricing consistency throughout the system. It also provides flexibility at the headend 208 to price various categories differently should this be desired. For example, distributed movies may be assigned the price category "movie" at the national site. Each headend 208 could then charge differing amounts for their movies by manipulating their local price category database. If a current price structure needed to be changed, the change would be made once in the price category database instead of in each program record.

**[0173]** The EVENT LOG Database file 510 contains event data for a single day. There are many event files, one for each day of event information. The actual filename for a given days events is assigned under computer control. Events are broken up into single days so they may be easily archived. A cross-reference of days to computer generated filenames is kept.

**[0174]** Each event record contains a unique ID, an event code, ID of the process that generated the event and date/time stamp of the event.

**[0175]** The EVENT LOG FILENAME Database file 507 contains a cross-reference of start date to computer generated filenames.

**[0176]** The VIEWER LOG Database file 512 contains viewer log data for a single day. There are many viewer log files, one for each day of viewer log information. The actual filename for a given days viewer log data is assigned under computer control. Viewer log data is broken up into single days so it may be easily archived. A cross-reference of days to computer generated filenames is kept.

**[0177]** Each event record contains a unique ID, an event code, ID of the process that generated the event and date/time stamp of the event. The Marketing Information Interface 402 accesses the VIEWER LOG Database file as necessary to retrieve "program watched" information 420.

**[0178]** The VIEWER LOG FILENAME Database file 509 contains a cross-reference of date to computer generated filenames.

**[0179]** The BILLING Database file 511 contains billing data for a single day. There are many billing files, one for each day of billing information. The actual filename for a given days billing data is assigned under computer control. Billing data is broken up into since days so it may be easily archived. A cross-reference of days to computer generated filenames is kept.

**[0180]** Each event record contains a unique ID, an event code, ID of the process that generated the event and date/time stamp of the event.

**[0181]** The BILLING FILENAME Database file 508 contains a cross-reference of start date to computer generated

filenames.

**[0182]** The NEWS FILENAME Database file 509 contains a cross-reference of date to computer generated filenames.

**[0183]** The SET TOP Database file 517 contains set top converter records with each record representing a unique set top converter. Each set top is assigned to a headend 208. Set-top type, software version and serial number is also stored. Note that headend records must be provisioned before they may be referenced in a set top record.

**[0184]** The HEAD END Database file 518 contains headend records with each record containing headend 208 data specific to a single headend 208. Each headend 208 has a name, contact name, address, phone number, modem information, time zone (relative to GMT) and daylight savings time flag. This information may be stored in a separate database file called Cable Franchise Configuration (shown as 328 in Figure 11).

**[0185]** The NATIONAL Database file 515 contains a single record containing national site information. This includes site name, contact, modem information, time zone and daylight savings time flag.

**[0186]** The CUSTOMER Database file 516 contains customer records with each record containing customer data specific to a single customer. This includes personal information (name, address, phone number, . . .) and assigned set top converter.

**[0187]** The TAPE MACHINE Database file 519 contains video tape or CD machine information. Each machine is assigned a unique ID, its control port address, its A/B switch address (if present), its assigned service and an A/B assignment. This database is only located at the headends 208.

**[0188]** The MESSAGE Database file 514 contains available system messages. They are detailed in nature and are pre-programmed. Each message has an associated function. To schedule a desired function the appropriate message is referenced in the scheduler task list.

**[0189]** The TASK Database file 513 contains scheduled tasks to be performed periodically. It is used in conjunction with a scheduler process to control computer system functions such as data dispatch and retrieval, archival and database maintenance. Each task is assigned a unique ID, start time, stop time, period in minutes) and task type (single, periodic, round-robin). Functions are actually scheduled by scheduling the appropriate message to be sent to the appropriate process. Available messages are kept in a separate database. Note that these messages must be provisioned before they may be referenced in a task record.

#### E. System Operations

**[0190]** Figure 11 shows the basic operations that must occur in order for the packaged signal to be sent to the satellite 206. External digital 280 and analog signals 282 must be received from television programming sources and converted to a standard digital format by a converter 284, as described above. Also within the Operations Center 202, stored programs 286 must be accessed using banks of looping tape machines or other video storage/retrieval devices, either analog or digital, and converted to a standard digital format by the converter 284 prior to use by the CAP 260.

**[0191]** The programmer or program packager utilizing the CAP 260 must input a variety of information, including program information, in order to allow the CAP 260 to perform its function of generating program control information and packaging programs. Some of the information required by the CAP 260 are the date, time slots and program categories desired by the television programmer.

**[0192]** The CAP 260 system includes one or more CPUs and one or more programmer/packager consoles, together identified in Figure 4 as workstations 262. In the preferred embodiment each packager console includes one or more CRT screens, a keyboard, a mouse (or cursor movement), and standard video editing equipment. In large Operations Centers 202, multiple packager consoles 262 may be needed for the CAP 260.

**[0193]** As shown in Figure 12, the first step in the operation of the CAP 260 is selecting the type of programming 300 which will be packaged. Basically there are six broad categories in which most television programming can be classified: static programming 302, interactive services 304, pay per view 306, live sports specials 308, mini pays 310, and data services 312. Static programs are programs which will show repetitively over a period of time such as a day or week. Static programs include movies showing repetitively on movie channels, children's programs, documentaries, news, entertainment, Program services, with defined start and end time periods, behave like static programs and may be handled in a similar manner.

**[0194]** Interactive services 304 typically include interactive programs using the Vertical Blanking Interval (VBI) or other data streams synchronized with the programming to communicate interactive features (such as those used in education), and games. Using this feature, interactive home shopping programs are possible Pay per view 306 are programs which are individually ordered by the subscriber. After ordering, the subscriber is authorized to access the program for a limited time. (e.g. three hours, two days, etc.). Live sports specials are live events usually related to sports which subscribers are unlikely to watch on taped delay.

**[0195]** Mini pays 310 are channels to which existing set top converter boxes (not shown) and the set top terminals 220 of the present invention may subscribe. The subscriptions for mini pays 310 may be daily, weekly, or monthly. An example would be the Science Fiction channel. Data services 312 are services in which information is interactively pre-

sented to the subscriber using a modem or other high rate of speed data transfer. Some examples are Prodigy, services for airline reservations, and TV guide services (e.g. TV Guide X\*PRESS™, InSight™, etc.). Data could also include classified or other forms of advertising.

**[0196]** The packager begins the CAP processing using the Packager Data Entry Interface Software 400 and a workstation 262. After selecting the type of programming, the packager must identify a pool of programs (within a category) to be packaged. The next CAP step varies for different program categories. For the category of live sports 308, additional program interstitial elements 314 such as promos and other sports news may be added before further processing. For the live sports 308, static (or program service) 302, interactive services 304 and pay per view 306 categories, the next CAP 260 step is for one television program to be selected 316. This is followed by each program individually being assigned dates to be played, a start date (for continuous play) and start times 318. Many dates and start times may be assigned to any given program. Using this methodology, programs may be purchased by viewers in time slices (e.g., one week). The program information for these categories may then be processed for allocation of transponder space and setting of prices, as indicated at blocks 320, 322, respectively.

**[0197]** Mini pays 310 and data services 312 require less processing by the CAP 260. After identifying the mini pays 310, the CAP 260 may proceed to allocation of transponder space and pricing, block 320, for the mini pays 310. Data services in the preferred embodiment generally do not require allocation of transponder space and generally do not require price setting. The information for data services 312 may be directly processed for menu configuration, block 324. In alternate embodiments, the data services 312 may be processed through these portions of the CAP 260 program.

**[0198]** The CAP 260 uses a interactive algorithm 416 to allocate transponder space 320 and set prices 322. The factors weighed by the algorithm are: 1. buy rates of the program, 2. margin of profit on the program, 3. length of the program, 4. any contractual requirement which overrides other factors (such as requirement to run a specific football game live in its entirety). The information on buy rates of the program may be obtained by the Marketing Information Interface 400 from a Central Statistical and Billing Site, a Regional Statistical and Billing Site, the cable headend 208 or directly from the set top terminals 220 as will be described later. The CAP 260 must consider the priority levels of programming (e.g., Figure 16) when allocating transponder space. Particularly, as in the preferred embodiment, transponders are assigned to three specific priority levels. The CAP may automatically (without packager intervention) access the MII 400 and the EIS to obtain necessary decision making information on transponder allocation.

**[0199]** Following transponder allocation and price setting 320, 322, respectively, the CAP 260 proceeds to menu configuration 324. The positioning of programs within the menu configuration 324 can have an effect on subscriber buy rates for the program. (The processing of menu configurations 432 is also described in reference to Figure 8.) Therefore an algorithm accounting for either a manually assigned program importance or a calculated weight of the program importance is used to determine each programs position within the menu scheme. For instance, a popular program with a high profit margin may be assigned a high weight of importance and shown in a prominent place in the menu scheme. Alternatively, a high profit program with sagging sales may be manually assigned a prominent place in the program schedule to increase sales.

**[0200]** After a series of entries by the programmer/packager at the Operations Center 202, the CAP 260 displays draft menus 434 or schedules (including priority levels) for programming. The packager may now manipulate the menus and schedules and make changes as necessary 436. After each change, the packager may again display the menus or schedules and determine if any more changes are necessary 436. The packager may use the Executive Information System with yield management as described below to assist in editing the menus and schedules. When the packager is satisfied with the menu configuration 324 and scheduling of television programs, the packager may then instruct the CAP 260 to complete the process.

**[0201]** After menu configuration 324, the CAP 260 may begin the process of generating a program control information signal 326 (see also Figure 8 software description at 442 and 404). In order to generate program control information signals 326 which are specific to a particular cable headend 208 system, the CAP 260 incorporates cable franchise configuration information 328. In the preferred embodiment, unique cable franchise configuration information 328 is stored at the Operations Center 202. The cable franchises upload changes to their specific franchise information 426 from time to time to the Operations Center 202 for storage 328. Preferably, a separate CPU (not shown) handles the management of the cable franchise information 328. From the stored cable franchise information 328, the CAP 260 generates a cable franchise control information signal 330 unique to each franchise.

**[0202]** Using the unique cable franchise control information signals 328 and the menu configuration 324 information, the CAP 260 generates the program control information signal 276, as shown at function block 326. The program control information that is unique to a particular cable franchise may be identified in various ways such as with a header. With the header identification, the cable headend 208 may extract the portions of the program control information signal 276 it needs. Now, the CAP 260 may complete its process by electronically packaging the programs into groupings 280 for the signal transmission and adding the program control information 276 to the packaged programs 334 to form a single signal for transmission. Through manual entries by the packager (PDEI 400) or by comparing against a list of pro-

grams, the CAP 260 will determine whether the programs are arriving from external sources 280 or sources internal 286 to the Operations Center 202.

[0203] Referring back to Figure 11, upon completion of the CAP's functions, the Operations Center 202, or the uplink site 204 (Figure 1), compresses 288 (if necessary), multiplexes 290, modulates 292 and amplifies 294 the signal for satellite transmission 296. In a basic embodiment, the CAP 260 will also allow entry of time slots for local avails where no national programming will occur.

[0204] Figure 13 is a more detailed flow chart 340 of some of the functions performed by the CAP 260 after an initial program schedule has been entered and menu configurations generated. This flow chart highlights that some of the functions described earlier in reference to Figures 8, 9, 11 and 12 can be performed in parallel. The flow chart 340 shows six basic functions that are performed by the CAP 260: (1) editing program schedule for local availability 342 (only for non-standard services. i.e., those services that are not national cable services); (2) generating program control information signals 344; (3) processing external programs 346; (4) processing internal programs 348; (5) processing live feeds 350; and, (6) packaging of program information 352. In an alternate embodiment, the CAP 260 is capable of incorporating local programs and accommodating local availability for local television stations.

[0205] Following completion of the programming scheduling (accounting for local availability if necessary) and menu generation 342, the CAP 260 may perform three tasks simultaneously, generating program information signals 344, processing external programs 346 and processing internal programs 348.

[0206] The CAP 260 automatically identifies external programs feeds 356 and identifies which external feed to request the external program 358. The CAP 260 gathers and receives the external programming information 280, 282 (Figure 11) and converts it to a standard digital format 360 for use. The CAP 260 also identifies internal programs 362 (and defined program services), accesses the internal programs 364 (and program services), and converts them to a standard digital format 366, if necessary. In addition, the CAP 260 identifies live signal feeds 368 that will be necessary to complete the packaged programming signal 370. In its last task depicted in Figure 13 the CAP 260 completes the packaging of the programs and combines the packaged program signal with the program control information signal 352, amplifies the signal 354 and sends it out for further processing prior to uplink.

#### F. Allocation of Cable System Bandwidth

[0207] One of the primary tasks of the Operations Center 202 is, with assistance from the cable headends 208, effective utilization of available bandwidth from the Operations Center 202 to the subscriber homes. Figure 14 shows effective allocation of 750 MHz of bandwidth (1 MHz to 750 MHz) for television programming. In Figure 14, bandwidth is allocated for both analog 226 and digitally compressed 227 signals. In the preferred embodiment, the bandwidth is divided so that each category of programs receives a portion of the bandwidth. These categories correspond with major menus of the set top terminal software. The representative categories shown in Figure 14 include; (1) high definition TV (HDTV) made possible through the use of compression technology. (2) A La Carte Channel category which provides specialty channels for subscription periods such as monthly, and (3) pay-per-view.

[0208] Figure 15 shows a chart 228 of compressed channel allocation for a variety of programming categories 229 that have been found to be desirable to subscribers. By grouping similar shows or a series of shows into blocks of channels 230, the system 200 is able to more conveniently display similar programming with on-screen television menus. For example, in the movie category, which has the greatest allocation of channels, the same movie may be shown continuously and simultaneously on different channels. Each channel starts the movie at a different time allowing the subscriber to choose a more suitable movie starting time (e.g., every 15 minutes).

[0209] In order to accommodate cable TV systems that have different bandwidths and channel capacities, the television programming and television program control information may be divided into parts such as priority one, two and three. The large bandwidth cable TV systems can accommodate all the parts of the television programming and all parts of the television programming control information. Those cable TV television programming control information. Those cable TV systems with a more limited bandwidth are able to use the program delivery system 200 by only accepting the number of parts that the cable system can handle within its bandwidth.

[0210] For instance, as is shown in Figure 16, three cable television systems with different bandwidths may use the program delivery system 200 simultaneously with each system accepting only those parts of the information sent which it is capable of handling. Priority one television programming and menus 240 are accepted by all three systems. Priority two television programming and menus 242 are not accepted by the cable television system whose capacity is the smallest or in this case 330 MHz (40 channels) system. Priority two television programming and menus 242 are accepted and used by the two larger capacity cable television systems shown. Priority three television programming and menus 244 are only used by the largest capacity television system which is capable of handling all three parts -- Priority one, two and three programming and menu information.

[0211] With this division of television programming and menus, the program delivery system 200 may be utilized simultaneously by a variety of concatenated cable systems 210 (depicted in Figure 1) with varying system capacities.



By placing the heavily watched or more profitable programming and menus in the priority one division 240, both users and owners of the cable TV systems will be accommodated as best as possible within the limited bandwidth.

[0212] Figure 17 shows three different cable headend 208 systems, each system receiving the entire satellite signal from the Operations Center 202 and stripping those parts of the signal which cannot be handled by the local cable system due to bandwidth limitations. In this particular embodiment, the three local cable television systems shown have bandwidth limitations which correspond with the bandwidth limitations depicted in the previous Figure 16. As the bandwidth decreases the programming options available to the viewer in the exemplary on-screen menu decreases. Using this preferred embodiment, the Operations Center 202 is able to send one identical signal to the satellite 206 that is sent to all the cable headends 208. Each cable headend 208 accepts the entire signal and customizes the signal for the local cable system by stripping those portions of the Operations Center signal that are unable to be handled by the local cable system. An alternate embodiment (not shown) requires the Operations Center 202 (and uplink sites 204) to send different signals for reception by different capacity cable headends 208.

[0213] There are several ways in which a cable headend 208 may strip the unnecessary signal from the Operations Center 202. A person skilled in the art will derive many methods from the three examples discussed below. The first method is for the signal originating from the Operations Center 202 (and uplink site 204) to be sent in portions with each portion having a separate header. The respective cable headend 208 would then recognize the headers and transmit to the concatenated cable system 210 only those signals in which the proper headers are identified. For example, using three concatenated cable systems shown in Figure 17, the headers may be "001," "002," and "003." A wide bandwidth concatenated cable system can accept program signals with all three headers, while the narrowest bandwidth concatenated cable system may only be able to accept signals with a "001" header. For this first method, a central Operations Center 202 must divide the program signal into three parts and send a separate leading header before each signal for each part. This method requires has the additional signal overhead of a header on the program signal. The header would be transmitted from time to time as necessary.

[0214] A second method requires a set of transponders to be assigned to each priority level and the cable headend 208 to route signals from the transponders corresponding to the proper priority level for the concatenated cable system 210. For example, if there are three priority levels and eighteen transponders, transponders one through nine may be assigned to priority level one, transponders ten through fourteen priority level two, and transponders fifteen through eighteen assigned to priority level three. Thus, a concatenated cable system 210 capable of operating only at priority level two, would only receive signals from transponders one through nine, and ten through fourteen from the respective cable headend 208. The Program signal from transponders fifteen through eighteen would not be transmitted to the priority level two concatenated cable system. This method requires the Operations Center 202 to properly assign programs to transponders by priority level. This can be accomplished by the CAP using the software described earlier (e.g., Figure 8 at 438 and 440).

[0215] The third and the preferred method is for the cable headend 208 to pick and choose programming from each transponder and create a customized priority one, two, and three signal with chosen television programming. The cable headend 208 would then route the appropriate customized signal to each part of the concatenated cable system 210 that the cable headend 208 serves. This third method requires that the cable headend 208 have a component, such as the combiner (described in greater detail in a co-pending U.S. Patent Application entitled Digital Cable Headend For A Cable Television Delivery System. Ser. No. \_\_\_\_\_, filed \_\_\_\_\_, owned by the assignee of the present application) which can select among programs prior to combining the signal for further transmission on a concatenated cable system 210. The third method requires the least coordination between Operations Center 202 and the cable headend 208.

[0216] In addition to dividing the television programming and menus into parts, the Operations Center 202 of the preferred embodiment is also capable of dynamically changing the bandwidth allocation for a particular category of programming. Figure 18 depicts this dynamic change in bandwidth allocation from a typical week day prime time signal 250 to a Saturday afternoon in October signal 252 (during the college football season). Figure 18 highlights the fact that the bandwidth allocated to sports is limited to eight selections 251 during week day prime time 250 but is increased to sixteen selections 253 during a Saturday afternoon in October 252. This dynamic increase in bandwidth allocation allows the system to accommodate changes in programming occurring on an hourly, daily, weekly, monthly, seasonal and annual basis.

[0217] In addition to dynamically allocating bandwidth for programming categories, the Operations Center 202 can also dynamically change the menu capacities in order to accommodate the change in programming and bandwidth. For example, on a Saturday afternoon in October 252, the major menu for sports may include a separate subcategory for college football. This subcategory would, in turn, have a separate submenu with a listing of four, six, eight, or more college football games available for viewing. In order to accommodate this dynamic menu change, the Operations Center 202 must add a submenu listing to the major sports menu, create a new or temporary submenu for college football, and allocate the necessary menu space on the college football submenu.

[0218] Once the television programs have been packaged and a program control information signal is generated to



describe the various categories and programs available, the packaged programs are then digitized, compressed, and combined with the program control information signal. Upon the signal's departure from the Operations Center 202 the breakdown into categories is insignificant and the signal is treated like any other digitally compressed signal

#### 5 G. Compressing and Transmitting Program Signals

[0219] After packaging, the packaged television program signal is prepared for satellite transmission and sent from the Operations Center 202 to the cable headend 208 via satellite 206. Depending on the specific embodiment, the television program signal may need to be compressed, combined/multiplexed, encoded, mapped, modulated, upconverted and amplified. This system, which is intended to be compatible with existing C and Ku Band satellite transmission technologies, accepts video, audio and data signals ranging in signal quality, and input from a number of sources.

[0220] As shown in Figure 3, in the preferred embodiment, the packaged program signal will be treated at a master control uplink site 211 prior to being transmitted to the satellite 206. Following compression the channels must be multiplexed for each transponder carrier and sent to the satellite 206 dish that will provide the uplink. A variety of multiplexing schemes may be used in the system. In some situations, it may be advantageous to use different multiplexing schemes in different parts of the overall system. In other words, one multiplexing scheme may be used for satellite transmission 206 and a second remultiplexing scheme for the land transmission. Various satellite multi-accessing schemes and architectures can be used with the system, including both single channel per carrier (SCPC) frequency division multiplex (FDM) and multiple channel per carrier (MCPC) time division multiplexing (TDM). Time division multiplexing is the more desirable scheme. Once the signal has arrived at the uplink or master control site 211, it must be modulated, upconverted, and amplified. Various types of satellites and transponders capable of handling digital signals may be used in this cable television packaging and delivery system. One of the achievements of the present invention is effective utilization of digital compression technology by packaging television programs into categories that allow easy access to television programs by consumers. With current digital compression techniques for video, the typical 50-channel capacity cable satellite receiving system can be increased to 300 channels.

[0221] Presently, one transponder is used for each satellite delivered channel. The preferred embodiment uses 18 satellite transponders and compression ratios of 4:1 to 8:1 to achieve a capacity of 136 satellite delivered channels. More transponders or higher compression ratios can be used to deliver up to the channel capacity of any existing cable system.

[0222] An example of a satellite that may be used is the AT&T Telstar 303. The signal is transmitted from the satellite 206 to the cable headend 208 where a computer system including a digital switch treats the signal and delivers it through cables to a subscriber's home. In alternate embodiments, multiple Operations Center 202 and multiple uplink sites 211 can be simultaneously utilized.

#### 35 H. Cable System Use of Control Signal

[0223] Figures 19 through 21 depict sample menu screens produced by the set top terminal 220 using the program control information signal 276. Figure 19 shows a menu which enables the viewer to select a program category or program service from among a choice of eight program categories. Figure 20 shows a menu for the viewer to select a hit movie from among ten hit movies. Figure 21 provides information about a movie (or event) and enables a viewer to order the movie for viewing.

[0224] Figure 19 through 21 show text generation by the set top terminal 220. This text is generated using information received via the program control information signal. Figure 20 shows the text 380 generated for the hit movies major menu. In the preferred embodiment, text 380 such as that shown in Figures 19 through 21 is generated separately by a text generator (not shown) in the set top terminal unit 220. Those portions of the text that generally remain unchanged for a period of weeks or months may be stored in EEPROM or other local storage. For example, the text "HIT MOVIES from" 382 will consistently appear on each hit movies' major menu. This text may be stored on EEPROM or other local storage. Further, text such as that which appears at the lower center part of the screen "PRESS HERE TO RETURN TO CABLE TV" 384 appears many times throughout the menu sequence. This text may also be stored locally at the set top terminal 220. Text which changes on a regular basis, such as the movie titles (or other program selections), will be transmitted to the set top terminal 220 by either the operations center 202 or the cable headend 208. In this manner, the cable headend 208 may change the program selections available on any major menu modifying the program control information signal sent by the operations center 202 and transmitting the change. The network controller 214 of the cable headend 208 generally modifies the program control information signal and transmits the set top terminal control information signal (STTCIS). It is preferred that the text 380 is generated by the set top terminal 220 separately from the graphics because the text can be stored locally in a more compact manner requiring less storage space at the set top terminal 220. In addition, it allows for easy communication of text changes from the operations center 202 or cable

headend 208 to the set top terminal 220.

**[0225]** Figures 19 through 21 show the use of day, date and time 386 information on menus. This information may be obtained in a variety of ways. The day, date, and time information 386 may be sent from the operations center 202, the cable headend 208 (signal processor or network controller 214), the uplink site, or generated by the set top terminal unit 220 internally. Each manner of generating the day, date, and time information 386 has advantages and disadvantages which may change given the particular embodiment and costs. In the preferred embodiment, the day, date, and time 386 are generated at a central location such as the operations center 202 and are adjusted for regional changes in time at the cable headend 208.

**[0226]** In order for the set top terminal 220 to generate submenus for subcategories of categories shown in Figure 19 (which relate to the content of the programs), and to generate menus for movies such as Figure 21, the terminal must receive information on the content of the programs from the Operations Center 202 (via the cable headend 208). Normally the set top terminal 220 would receive this information in the form of the program control information signal (or STTCIS). As shown figure 21, in addition to the text needed for these program menus, video or program scenes are also necessary.

**[0227]** Live video signals may be used in windows of certain menus such as Figure 21. These video signals can be sent via the program control information signal, STTCIS, or can be taken off channels being transmitted simultaneously with the menu display. If the video signal is taken off a channel, less information needs to be sent via the program control information signal. However, this technique requires that separate decompression hardware be used for the program control information and the channel carrying the video. Separate decompressors for the video signals and program information signal allows for the greatest flexibility in the system and is therefore the preferred embodiment. A separate decompressor also assists in assuring that the switch from menus to television programming is smooth and without any significant time delay.

**[0228]** Live video for menus, promos or demos may be sent to the set top terminal 220 in several ways: a) on a dedicated channel, b) on a regular program channel and scaled to size, c) sent along with the program control information signal, etc. However, in the preferred embodiment, a great deal of short promos or demo video are sent using a split screen technique on a dedicated channel.

**[0229]** Using a split screen technique, any number of different video clips may be sent (e.g., 2, 4, 6, or 8 video clips). To show the video clip on a menu, the video must either be scaled and redirected to a video window on a menu screen or a masking methodology can be used. Masking involves playing the entire channel of video (all 2, 4, 6, or 8 split screens) in background and masking the unwanted video clip portions of the split screen by playing the menu in foreground and overlaying the unwanted background video. Masking is the least expensive method because it does not require any special hardware and it increases video throughput to the set top terminal 220. However, using the masking technique without any video redirecting causes each video clip to be located in a different position on the screen. It also requires the masking to be different for each video clip and makes consistent format difficult. On the other hand, scaling and redirecting video is generally difficult, expensive and requires additional hardware.

**[0230]** In order for the Operations Center 202 to prepare the promo video signal to be sent to the set top terminal 220, the Operations Center 202 must first identify the duration and actual video cut to be used for each promo and its position within the promo video signal. This information is maintained within the Operations Center 202 database. When it is time to produce the promo video signal (either to tape or to broadcast), each promo cut is scaled, positioned and combined with the other promos to form the single promo video signal. This is performed by readily available commercial equipment. Each promo is run repeatedly while the promo video signal is being generated. The audio signals of the individual promo cuts may be combined into the promo video signal audio tracks based upon the number of audio tracks available. The mapping of the audio tracks to the promos is also stored in the Operations Center database. Additionally, the mapping of promos to the programs that they are previewing is also stored in the Operations Center database. All promo database data is made available to the set top terminal 220 through the STTCIS.

**[0231]** In the preferred embodiment, the Operations Center 202 transmits six video/graphic promos for advertising purposes all on one channel. The throughput of the video/graphics on a single channel can be increased through the use of digital compression techniques. The set top terminal 220 uses either video scaling and redirecting techniques or masking to utilize the six video scenes. Although the set top terminal 220 actually performs the manipulation of video as necessary to generate the "live" menus for the subscriber, the appropriately prepared video signals must be formed and sent by the Operations Center 202 to the set top terminal 220.

**[0232]** If a promo for a given program is available at the set top terminal 220, the viewer may command the set top terminal 220 to display the promo. Generally, this is done through program selection from a menu screen by the subscriber. The selected program is referenced to information about available promos and allows the set top terminal 220 to tune to the proper channel, select the appropriate menu overlay mask based on the promos position and switch on the audio track(s) if they are available. The promos position on the screen dictates the displaying of the "live" text (refer to the video window of Figure 21). The program associated with the currently selected promo may be purchased from this menu screen. Events, services and slices of time may be purchased from promotional menus.

[0233] Management of promo video signals at the Operations Center 202 is similar to that of other programs except that more information is needed in order to specify the details of the promo video signal. The broadcasting of the promo video signal is identical to the broadcasting of a video program.

[0234] In order to limit the amount of bandwidth needed to transmit the program control information signal, various compression techniques employed for non-video may be used such as block coding, contour coding, blob encoding, and run-length encoding. Further, the program control information signal may be divided into text and graphics, or video, text and graphics and then recombined at the set top terminal 220 using a text generator, graphics decompression, and video decompression as necessary.

[0235] As shown in Figure 2, an analog cable TV system 205 can continue to exist alongside and within the digitally compressed system of the present invention. The digital transmissions do not effect the analog system. In fact, the analog cable signal may be transmitted simultaneously on the same cable as the digital signal. Cable headends 208 may continue to supply subscribers with local channels in an analog signal format.

[0236] In the preferred embodiment, the Operations Center 202 and uplink 204 (Figure 1) or master control site 211 (Figure 3) are collocated. However, the Operations Center 202 and uplink site 204 may be located in different geographical places. Also, functions and equipment within the Operations Center 202 may be remotely located. For instance, the program storage may be at a different site and the programs may be sent to the CAP 260 via landline.

[0237] Alternate embodiments of the system 200 of the present invention may use multiple Operations Centers described above. In such an embodiment, it is preferred that one Operations Center be designated the Master Operations Center and all other Operations Centers be Slave Operations Centers. The Master Operations Center performs the functions of managing and coordinating the Slave Operations Centers. Depending on the method in which the Slave Operations Centers share functions, the Master Operations Center coordination function may involve synchronization of simultaneous transmissions from multiple Slave Operations Centers. To perform its functions, the Master Operations Center may include a system clock for synchronization.

[0238] An efficient method of dividing tasks among multiple Operations Centers is to assign specific satellite transponders to each Operations Center 202 and to assign external program sources to the nearest Operations Center 202. Of course, this division of resources may not always be possible. Since programming will be grouped into priority levels with each priority level likely to be assigned specific satellite transponders, it is also possible to assign each Operations Center 202 to a priority level. For example, in a three priority level system with two Slave Operations Centers A and B and 18 transponders, the Master Operations Center may be assigned priority level 1 and assigned 9 transponders. Slave Operations Center A may be assigned priority level 2 and 5 transponders, while Slave Operations Center B is assigned priority level 3 and 4 transponders. In a multiple Operations Center configuration dynamic bandwidth allocation and dynamic menu capacity allocation becomes more complex and will be coordinated by the Master Operations Center.

[0239] Just as in the alternate embodiment wherein multiple Operations Centers 202 are used, a delivery system may have multiple satellite uplinks. Preferably, each Operations Center 202 has one or more uplink sites. Each Operations Center 202 controls the functions of its assigned uplink sites and may assign one site as a master uplink site.

[0240] In another alternative configuration, in regions or areas without cable services, where subscribers might use backyard satellite systems (TV RO) to receive packaged television services, the set top terminal 220 will include the appropriate hardware to allow connection to the backyard satellite reception equipment, i.e., a typical communication port. In this configuration, the backyard satellite system will receive programming signals originating from the Operations Center 202 directly from the satellite transponders. No cable headend 208 is utilized with a backyard satellite system. The menu system within the set top terminal 220 will be programmed directly from the Operations Center 202. The Operations Center program signals and control signals arrive at the set top terminal 220 essentially unchanged. Additionally, in this configuration, an upstream communication mechanism must be in place at the subscribers home (e.g., modem) to communicate information to the Operations Center 202 such as program ordering information. The set top terminals 220 can be equipped with a modem port for this upstream communication to the Operations Center 202. The two alternative embodiments described in the preceding four paragraphs, and other such embodiments not specifically referred to herein but within the understanding of those skilled in the art, incorporate or combine one or more of the components of the system 200 of the present invention.

[0241] Although the present invention has been shown and described with respect to preferred embodiments, various changes and modification that are obvious to a person skilled in the art to which the invention pertains are deemed to lie within the spirit and scope of the invention as defined by the following claims.

## Claims

1. A method for providing programming in a television delivery system, comprising:

packaging the programming at a television delivery center, wherein the packaging includes at least one pro-

gram;

generating menu information related to the programming packaging;

providing the menu information to terminals;

storing the menu information in the terminals;

displaying the menu information as programming menus, wherein a programming menu is displayed on a first portion of a display coupled to a terminal;

choosing a program from the displayed programming menu;

receiving a program selection based on the program chosen from the displayed programming menu;

switching the terminal to a television channel carrying the chosen program, wherein the switching step is completed in response to a single control function; and

displaying the chosen program on the display.

2. The method of claim 1, further comprising transmitting menu templates to the terminals, wherein the menu information is menu data and wherein the terminals create the programming menus based on the menu data and the menu templates.

3. The method of claim 1, wherein the programming menu is displayed using a television channel and wherein the switching step comprises switching the terminal from the television channel carrying the programming menu.

4. The method of claim 1, wherein the menu information is provided to the terminals as the programming menus.

5. The method of claim 1, wherein the choosing step comprises:

operating a control to highlight a program on the programming menu; and

operating the control to designate the highlighted program as the chosen program.

6. The method of claim 5, wherein a portion of the programming menu extends beyond a screen size of the display, the choosing step further comprising operating the control to scroll to the portion of the programming menu that exceeds the screen size.

7. The method of claim 6, wherein the control is a remote control, the remote control including cursor buttons to navigate the programming menu, scroll the programming menu and highlight the programs, and a go button to designate the chosen program, and wherein an operation of the go button completes the single control function.

8. The method of claim 1, further comprising updating the programming menus as programming packaging changes.

9. The method of claim 1, wherein the displayed program includes an overlay menu, the overlay menu further including a connection to alternate programming.

10. The method of claim 9, wherein the alternate programming includes access to an Internet service provider.

11. The method of claim 10, wherein a viewer accesses the Internet service provider by selecting the Internet service provider from the overlay menu and operating a go button on a control to connect to the Internet service provider.

12. The method of claim 1, wherein the menu data is provided to the terminal using the television delivery system or cellular networks or telephone lines or Personal Communication Networks.

13. The method of claim 1, wherein the menu data is provided over a cable television cable.

14. The method of claim 1, wherein the providing step further comprises:

sending the menu information to an on-line address; and

coupling the on-line address to the terminals, wherein when the on-line address is accessed, the menu information is displayed on the display as the programming menus.

15. The method of claim 14, wherein the chosen program is selected by selecting a program from the programming menus accessed through the on-line address.

16. The method of claim 15, wherein when the chosen program is selected, the terminal switches from the on-line address to a channel carrying the selected program.

17. A method for generating a television program menu for use by viewers in selecting programs based on program line-up information, comprising:

obtaining and storing the program line-up information for each program, the program line-up information including program name, program start time, program duration, program category and program price;  
generating menu data based on the program line-up information;  
creating a program control information signal using the generated menu data;  
transmitting the programs to the viewers; and  
transmitting the program control information signal simultaneously with the programs.

18. The method of claim 17, wherein the program control information signal includes information for identifying channel for interactive services and data services available to viewers, the method further comprising:

collecting information on the interactive and the data services available;  
inventorying the interactive and the data services to be made available to the viewer;  
assigning the channels for the interactive and the data services;  
determining a method of upstream transmissions for the interactive and the data services; and  
creating menu data for the interactive and the data services for transmission to the viewers.

19. The method of claim 18, wherein the interactive services include an Internet service provider.

20. The method of claim 18, further comprising gathering of program watched information from viewers, and wherein the organizing step further comprises:

targeting a television program; and  
managing the yield of the programs watched information for the targeted program so that the targeted program yields higher programs watched information.

21. A method for selecting a program from a broadcast television system, comprising:

generating program menu data;  
providing the menu data to a terminal in the broadcast television system;  
creating a menu from the menu data, wherein the menu includes a window;  
scrolling the menu to a desired program; and  
selecting the desired program for display on a display coupled to the terminal, wherein the selected program is displayed in response to a single control function.

22. The method of claim 21, wherein the generating step comprises:

packaging programs; and  
generating program control information related to the packaged programs, wherein the program control information includes the menu data and wherein the window is scalable.

23. The method of claim 22, wherein the programs are packaged by program category or by date and time of broadcast.

24. The method of claim 21, wherein the menu data is provided in a program control information signal.

25. The method of claim 24, wherein the program control information signal is provided in a vertical blanking interval or in a dedicated channel.

26. The method of claim 21, further comprising:

generating menu templates;  
providing the menu templates to the terminals; and

storing the menu templates in a memory of the terminal.

27. The method of claim 26, wherein the terminal creates a menu from the menu data, the menu displayed according to the menu templates.
28. The method of claim 26, wherein the menu templates include an introductory menu template, a home menu template, major menu templates and submenu templates, and wherein the displayed menu includes an introductory menu, a home menu, major menus and submenus.
29. The method of claim 28, wherein the major menus are arranged according to program categories, and wherein the major menus display programs available for viewing.
30. The method of claim 29, wherein the display of programs available for viewing comprises a list of program titles or a program rating.
31. The method of claim 21, wherein the menu is displayed on a television display, wherein portions of the menu exceed a display size of the television display, wherein the portions of the menu that exceed the display size are accessed by scrolling with a remote control, and wherein the window displays a video.
32. The method of claim 31, wherein the selected program is selected by selecting a program title using a remote control or a control on the terminal.
33. The method of claim 28, wherein the submenus include program description menus, notification menus, escape menus, and return to program menus.
34. The method of claim 33, wherein the program description menus include a program description, a program preview video, and a cost to order and wherein the program preview video is displayed in the window.
35. The method of claim 34, wherein the program description menus further include an order button, a return to menu button and a return to broadcast television button, wherein a program is ordered by highlighting the order button using a cursor and selecting the order button using a go button.
36. The method of claim 35, wherein the cursor and the go button are included in a remote control operably coupled to the terminal.
37. The method of claim 33, wherein the escape menu includes a time to program start, a cancel button and a return to broadcast television button, wherein operation of the cancel button ends a selected program without charge, the cancel button displayed for a fixed time measured from a start of the selected program.
38. A system that provides programming selection from a menu, comprising:
  - a television delivery system that packages programming, wherein the programming package includes at least one program, generates menu information related to the programming, and provides the programming package and the menu information to subscribers;
  - a terminal operably connected to the television delivery system, the terminal comprising:
    - a memory that stores the menu information,
    - a processor connected to the memory that processes the menu information to generate the menu, and
    - a control operably connected to the processor that provides program selection instructions to the processor; and
  - a display operably connected to the terminal that displays the menu and the programming, wherein the terminal switches to a channel carrying a program selected from the menu in response to a program selection instruction, the program selection instruction being a single control function.
39. The system of claim 38, wherein the channel is a virtual channel created by the terminal.
40. The system of claim 38, wherein the television delivery system provides menu templates to the terminal, the mem-

ory storing the menu templates, the processor generating the menus based on the menu templates and the menu information.

- 5 41. The system of claim 38, wherein the television delivery system provides the menu information as programming menus.
42. The invention of claim 1 or 38, wherein the television delivery system includes a cable television headend, or a backyard satellite receiver, or an operations center.
- 10 43. The invention of claim 42, wherein the operations center transmits the menu information and the programming to the cable television headend, and wherein the cable headend inserts local programming into the programming package and local menu information into the menu information.
- 15 44. The invention of claim 1 or 38, wherein the menu information includes date, time of day, channel and descriptive information for the at least one program.
45. The invention of claim 44, wherein the descriptive information includes a program title, a program rating, and a program start time.
- 20 46. The system of claim 38, wherein the program selection instructions include highlight a desired program and select the desired program.
47. The system of claim 38, wherein the control is a remote control, the remote control comprising:  
25        cursor buttons operable to navigate the menu, to scroll the menu, and to highlight programs shown on the menu; and  
         a select button operable to select a desired program, wherein an operation of the select button completes the single control function.
- 30 48. The invention of any one of claims 7, 32 and 47, wherein the remote control is an infrared or radio frequency control.
49. The invention of claim 48, wherein the remote control comprises cursor buttons and a go button, and wherein the cursor buttons are operated to scroll the menu and to highlight the desired program title and the go button is operated to select the highlighted program title.
- 35 50. The system of claim 38, wherein the television delivery system updates the menu information based on programming package changes and provides the updated menu information to the terminal.
- 40 51. The invention of claim 1 or 38, wherein the menu includes a video window used to display a video.
52. The invention of claim 51, wherein the video is an advertisement.
- 45 53. The invention of claim 52, wherein the advertisement is targeted to the terminal, preferably based on viewer data information.
54. The invention of claim 52, wherein the viewer data information includes programs watched information or viewer demographic information.
- 50 55. The invention of claim 52, wherein the advertisement is displayed prior to display of the chosen program.
56. The system of 38, wherein when the selected program is displayed, the selected program includes an overlay menu, the overlay menu including a connection to alternate programming.
- 55 57. The system of claim 56, wherein the alternate programming includes an on-line address.
58. The system of claim 38, wherein the programming package and the menu information are provided over a cable television cable.

59. The system of claim 38, wherein the programming package and the menu information are provided over a fiber optic cable, or are provided over a satellite broadcast and are received by a backyard satellite receiver.

60. An apparatus that provides for television program selection from a displayed menu, comprising:

5 a terminal that receives television programs and menu data related to the television programs;  
a display coupled to the terminal that displays the menu data and the television programs; and  
a control that scrolls through the menu data, cursors through the menu data, and selects a desired television  
10 program from the television programs, wherein when the desired television program is selected, the terminal  
switches to a channel carrying the selected television program and the display displays the selected television  
program.

61. The invention of any of claims 22, 38 and 60, wherein the programs include digital programs.

15 62. The apparatus of claim 60, further comprising

a backyard satellite receiver, wherein the television programs and, optionally, the menu data are received by  
the backyard satellite receiver, or  
a wireless modem, wherein the menu data is received by the wireless modem, or  
20 a cable modem, wherein the television programs and the menu data are received by the cable modem, or  
a fiber optic connector, wherein the television programs and the menu data are received by the fiber optic con-  
nector.

63. The apparatus of claim 60, further comprising:

25 a processor; and  
a memory coupled to the processor wherein the menu data is stored in the memory and wherein the processor  
processes the menu data to generate a television program menu.

30 64. The apparatus of claim 63, wherein the television program menu includes a video window, the video window pre-  
ferably displaying a program.

65. The apparatus of claim 64, wherein the program includes a still video or a moving video or text.

35 66. The apparatus of claim 64 or 65, wherein the program is related to the desired television program.

67. The apparatus of claim 60, wherein the channel is a virtual channel.

68. An apparatus for selecting programs, comprising:

40 a receiver that receives programs and program control information related to the received programs;  
a memory coupled to the receiver that stores the program control information;  
a processor coupled to the receiver and the memory, the processor processing the program control information  
to generate a program menu, the program menu stored in the memory, wherein the program menu provides a  
45 list of available programs for viewing;  
a display coupled to the processor that displays the program menu and the programs; and  
a control coupled to the processor, the control providing program selection signals, wherein the program selec-  
tion signals select a program for viewing on the display, the program selected from the list of available programs  
shown on the program menu.

50 69. The invention of any one of claims 1, 60 and 68, wherein the selected program includes a single event, a multiple  
event or a subscription.

70. The invention of claim 69, wherein the subscription includes a speciality channel subscription and a speciality pro-  
gram subscription, or on line services or data services

71. The invention of claim 70, wherein the speciality channel subscription includes monthly and annual subscriptions.



72. The invention of claim 70, wherein the speciality channel subscription is a first-run movie channel subscription or a sporting event subscription or a mini-pay subscription.

73. An apparatus for selecting programs, comprising:

a receiver that receives the programs and program information related to the received programs;  
a display that displays a program menu based on the program information; and  
a control, operable to select a program for viewing, the program selected based on the displayed program information, wherein a program available for selection includes a subscription to a speciality channel, and wherein operation of the control starts the subscription to the speciality channel.

74. The apparatus of claim 73, further comprising:

a memory coupled to the receiver, the memory storing the program information; and  
a processor coupled to the receiver and the memory, the processor processing the program information to generate the program menu, the program menu stored in the memory, wherein the program menu provides a list of available programs for selection.

75. The apparatus of claim 73, wherein the speciality channel includes a mini pay, or an on line service accessed through an Internet service provider

76. The apparatus of claim 73, wherein the program available for selection further includes a speciality program.

77. The apparatus of claim 76, wherein the speciality program includes a single event or a multiple event, preferably a sporting event.

78. The invention of claim 72 or 77, wherein the sporting event subscription includes a full season subscription and a partial season subscription or a favorite team subscription.

79. A method for selecting programs, comprising:

receiving programs and program information related to the received programs;  
displaying a program menu based on the program information; and  
ordering a subscription to a program using a remote control, the program listed in the program menu, wherein the subscription includes a subscription to a speciality channel.

80. The method of claim 79, wherein the subscription includes daily, monthly and annual subscriptions.

81. The invention of claim 73 or 80, wherein the speciality channel includes a first-run movie channel.

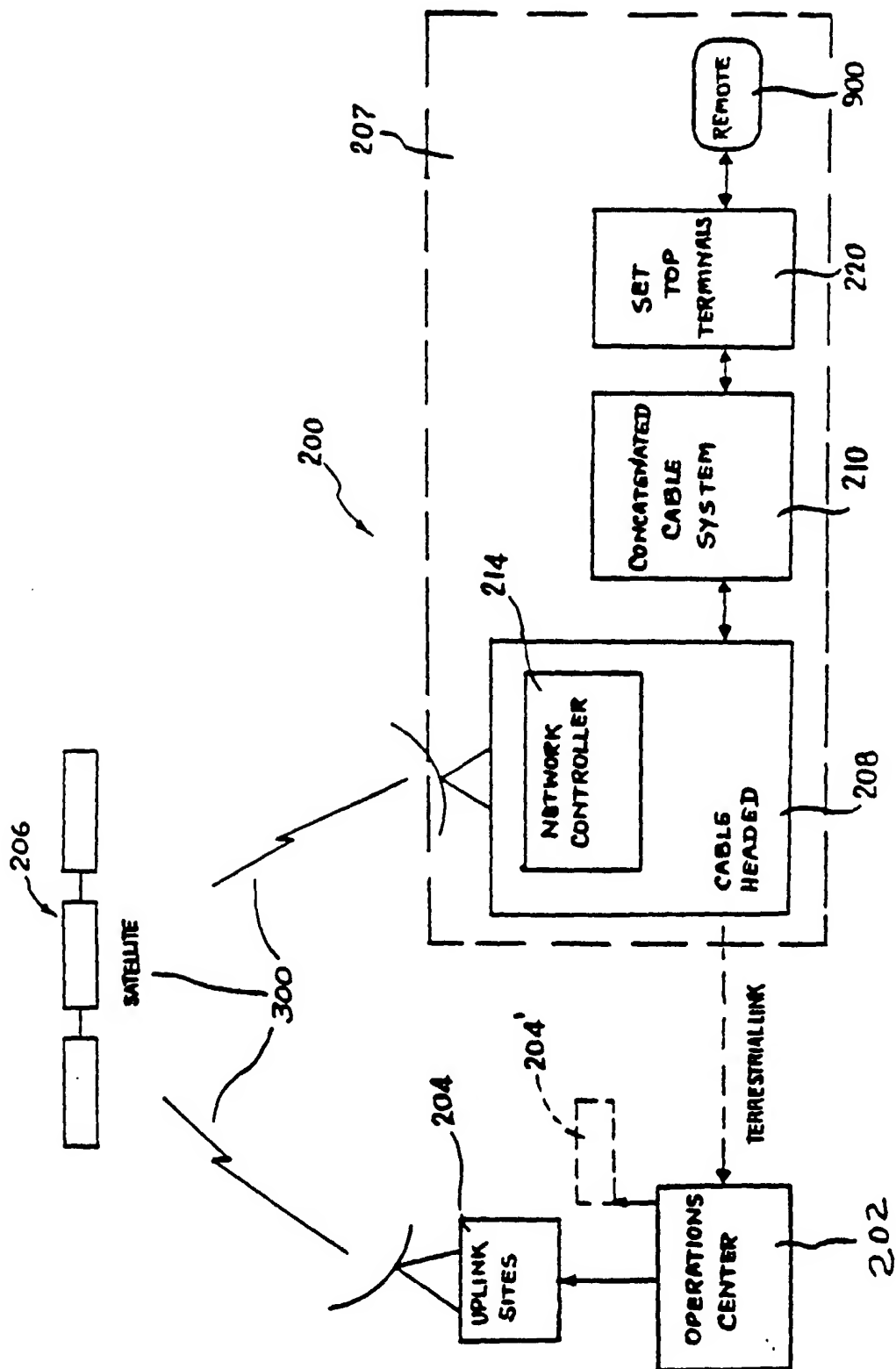


Fig. 1

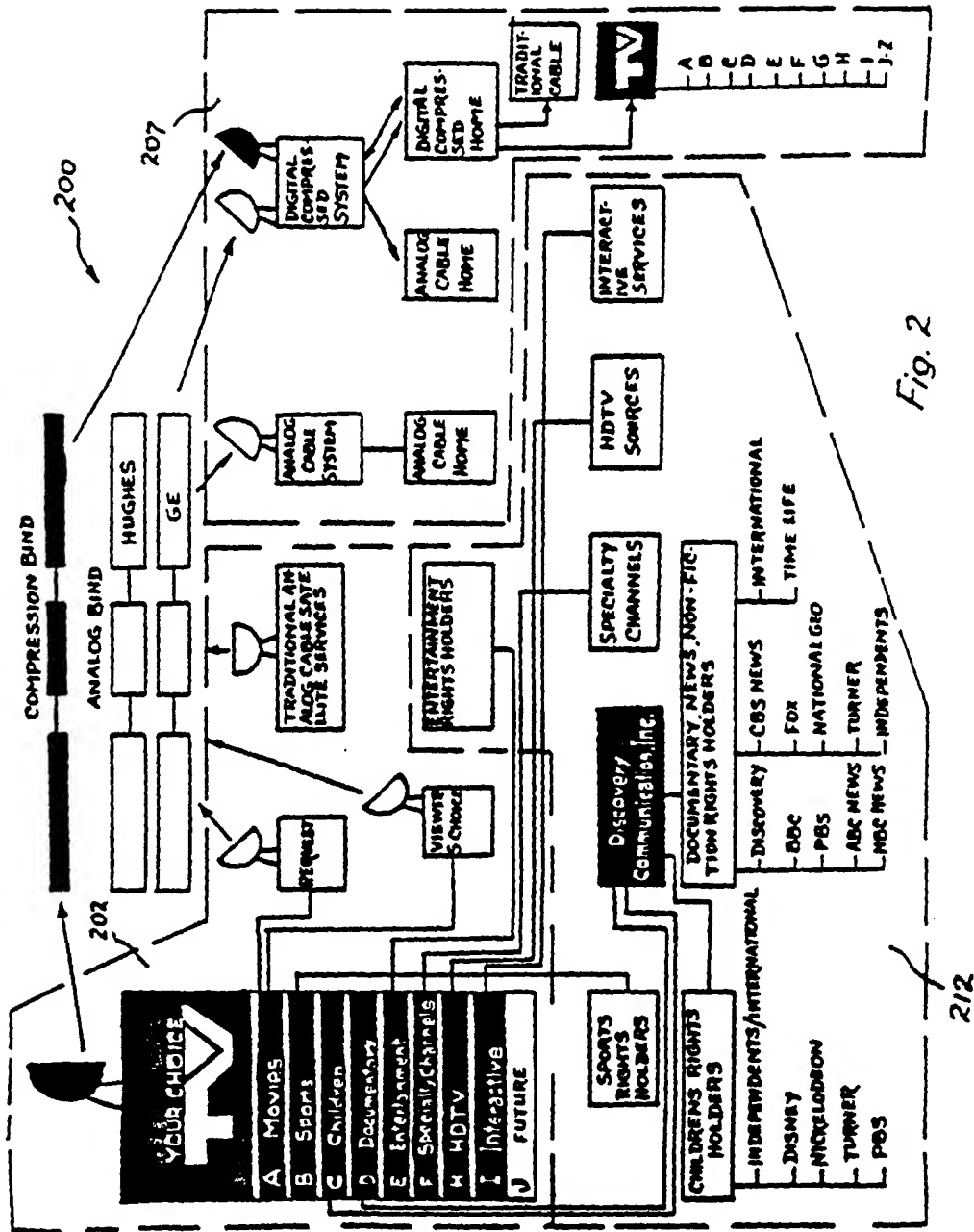


Fig. 2

212

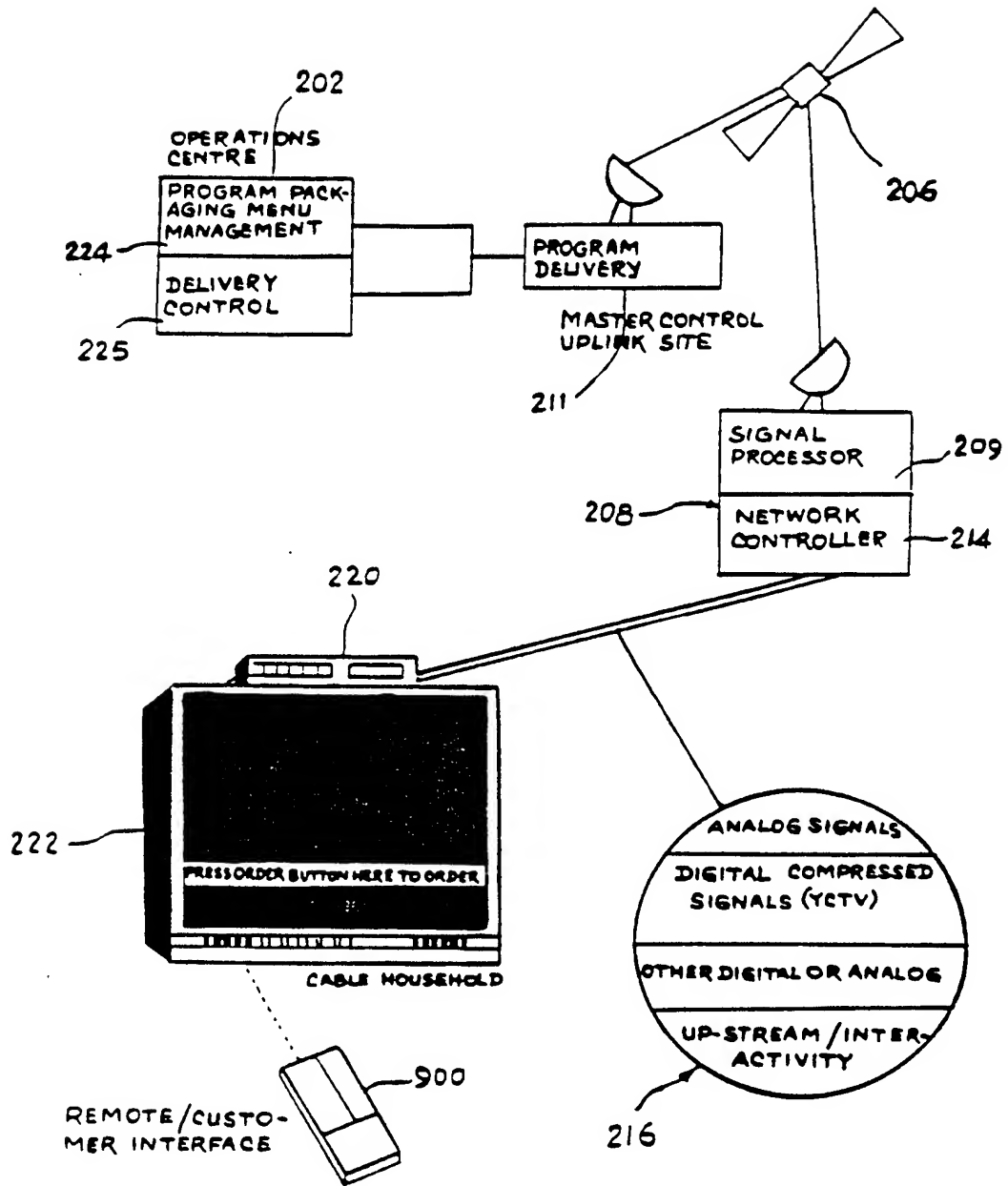


Fig. 3

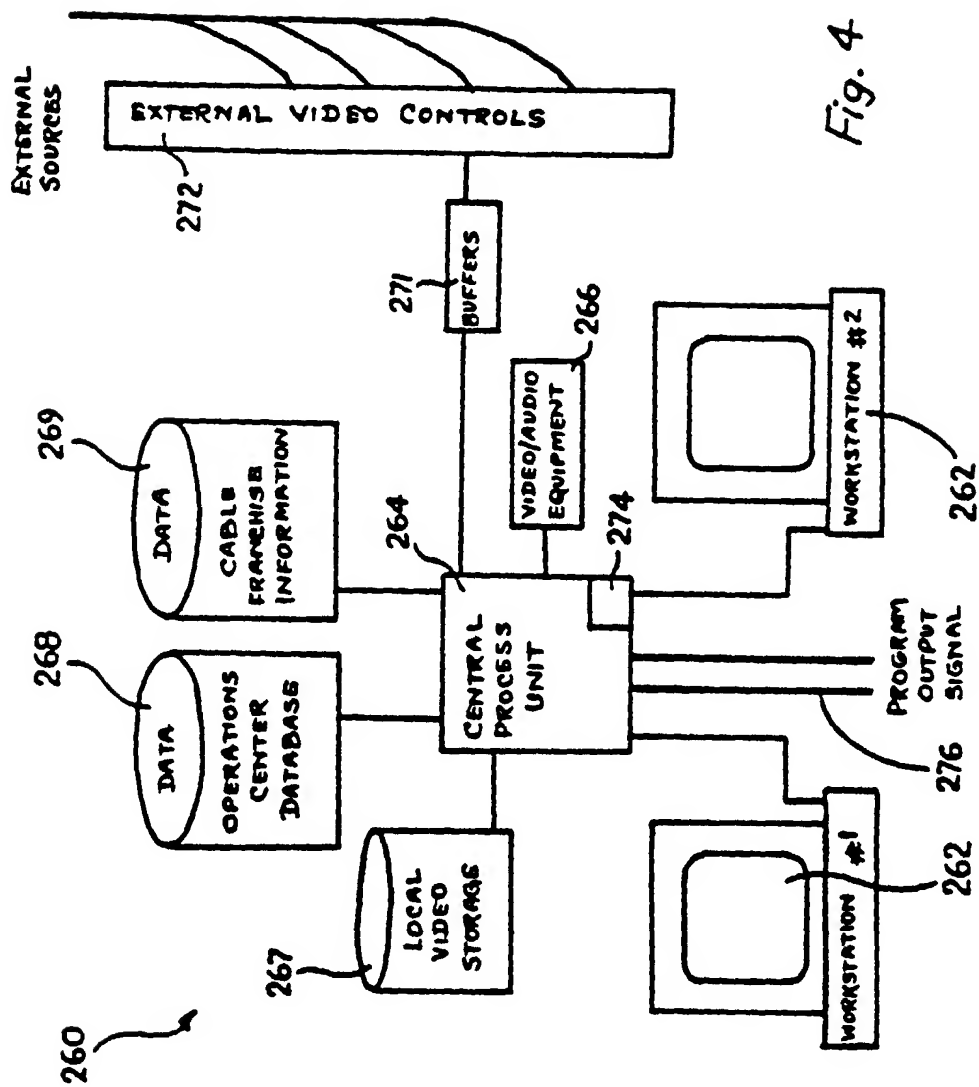


Fig. 4

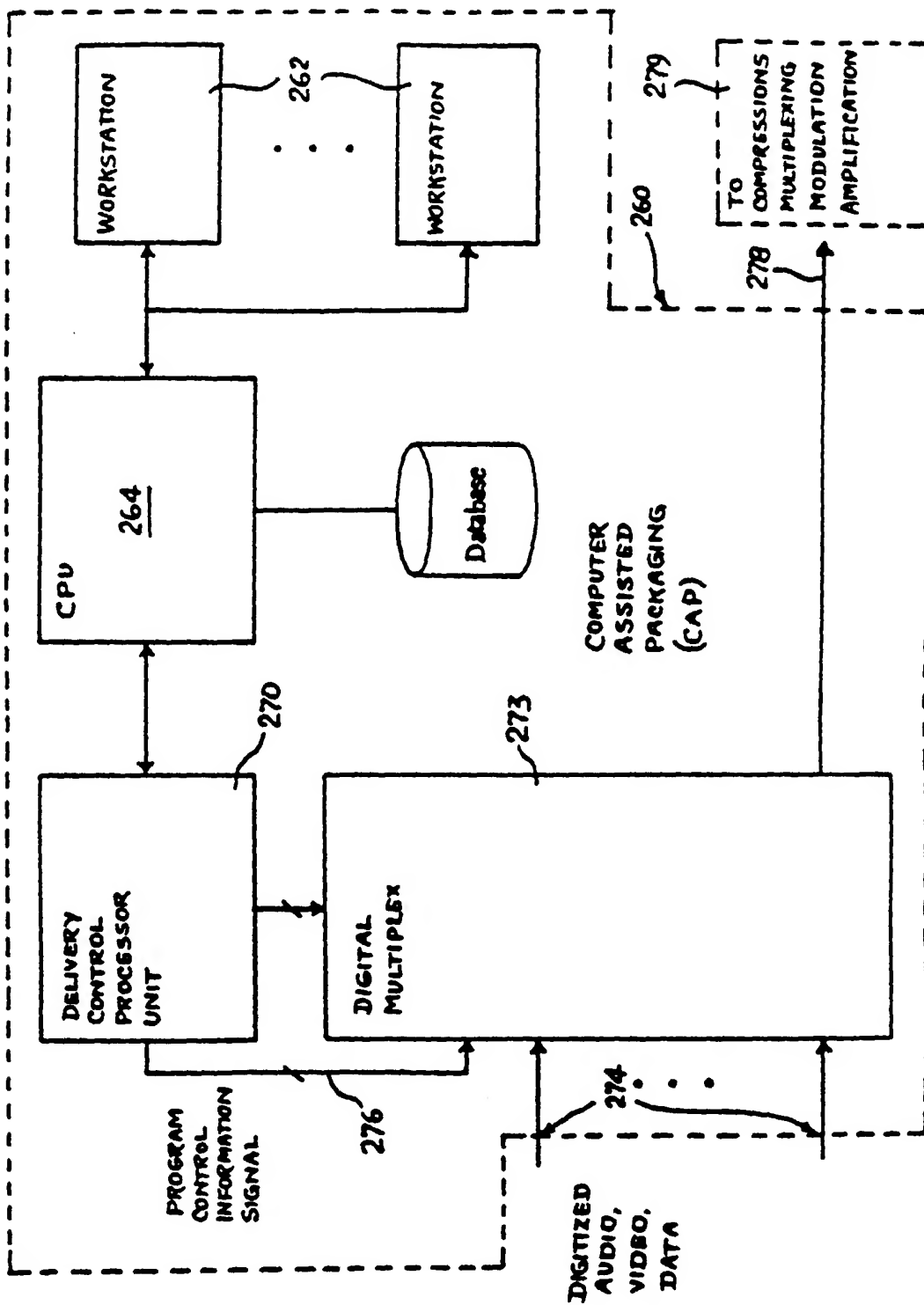
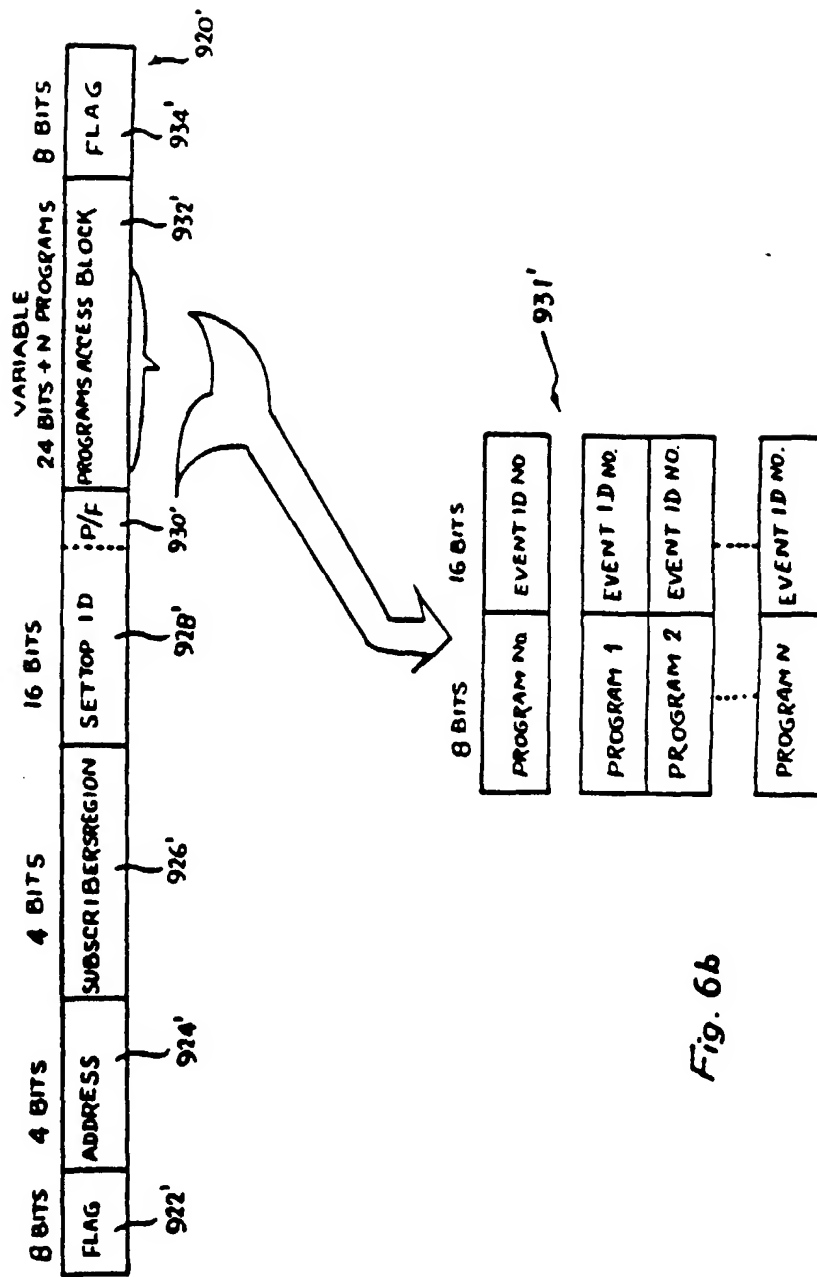
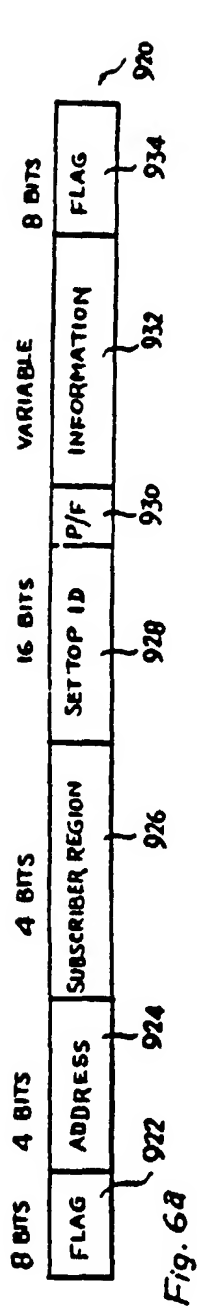


Fig. 5



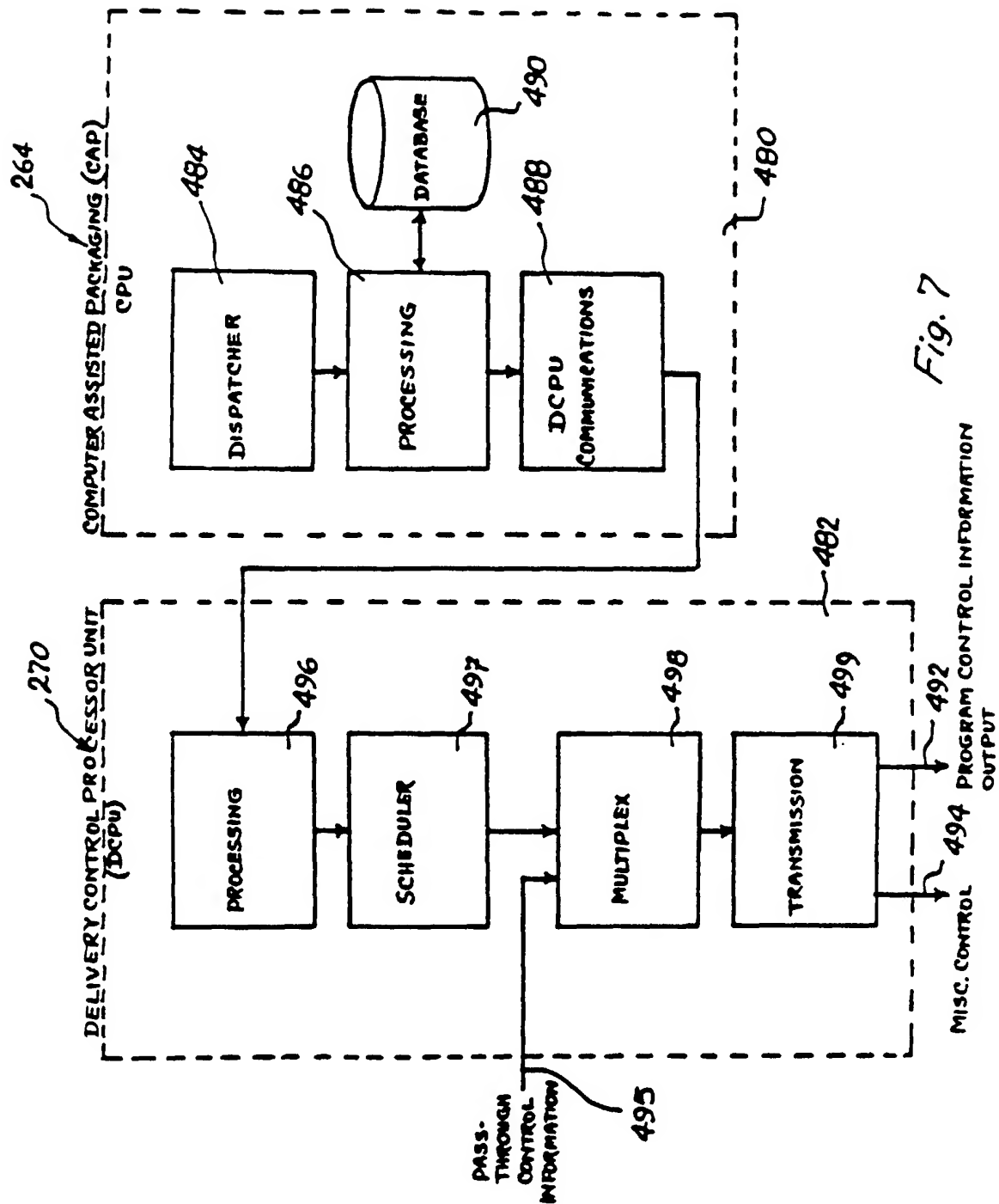


Fig. 7



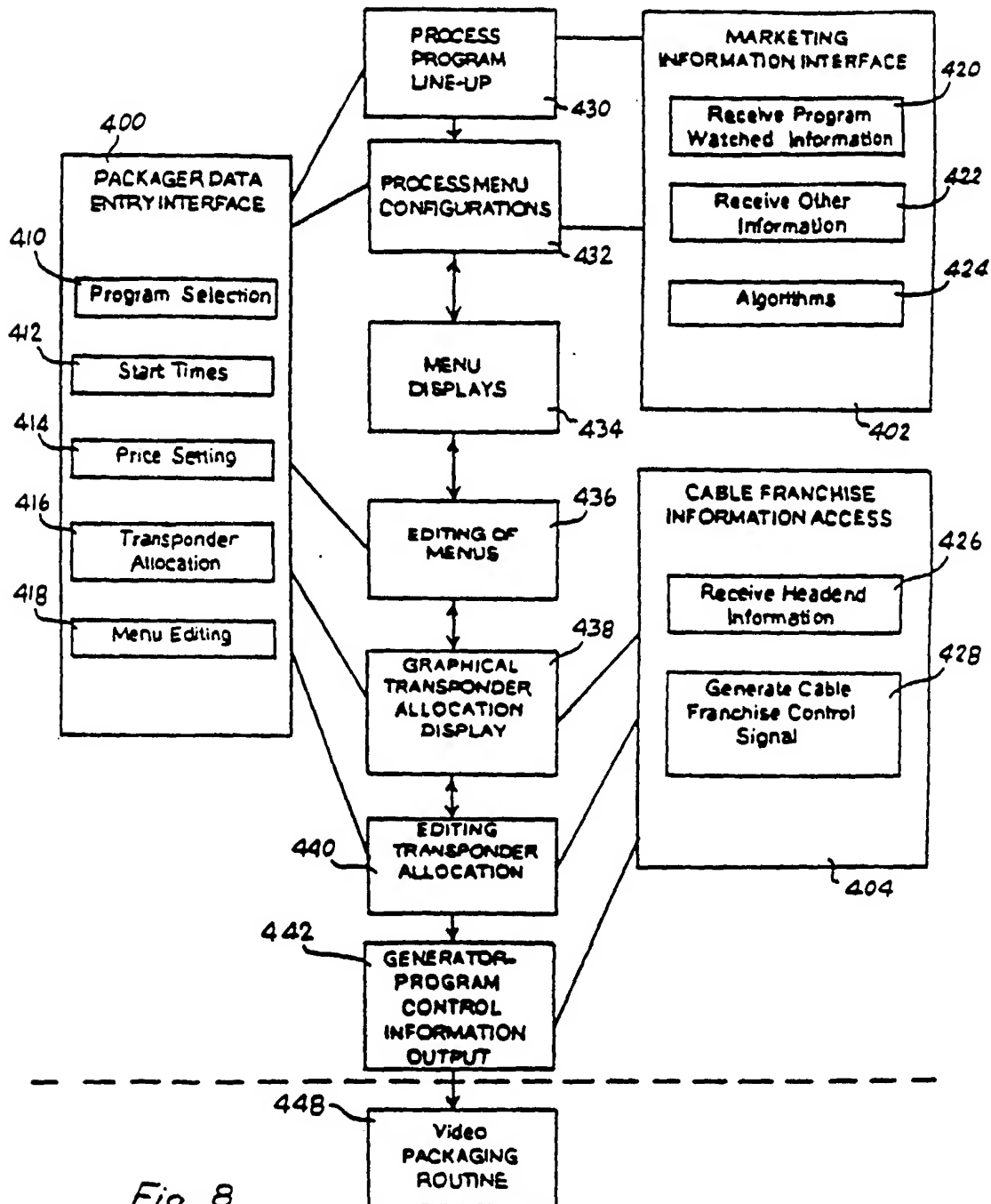


Fig. 8

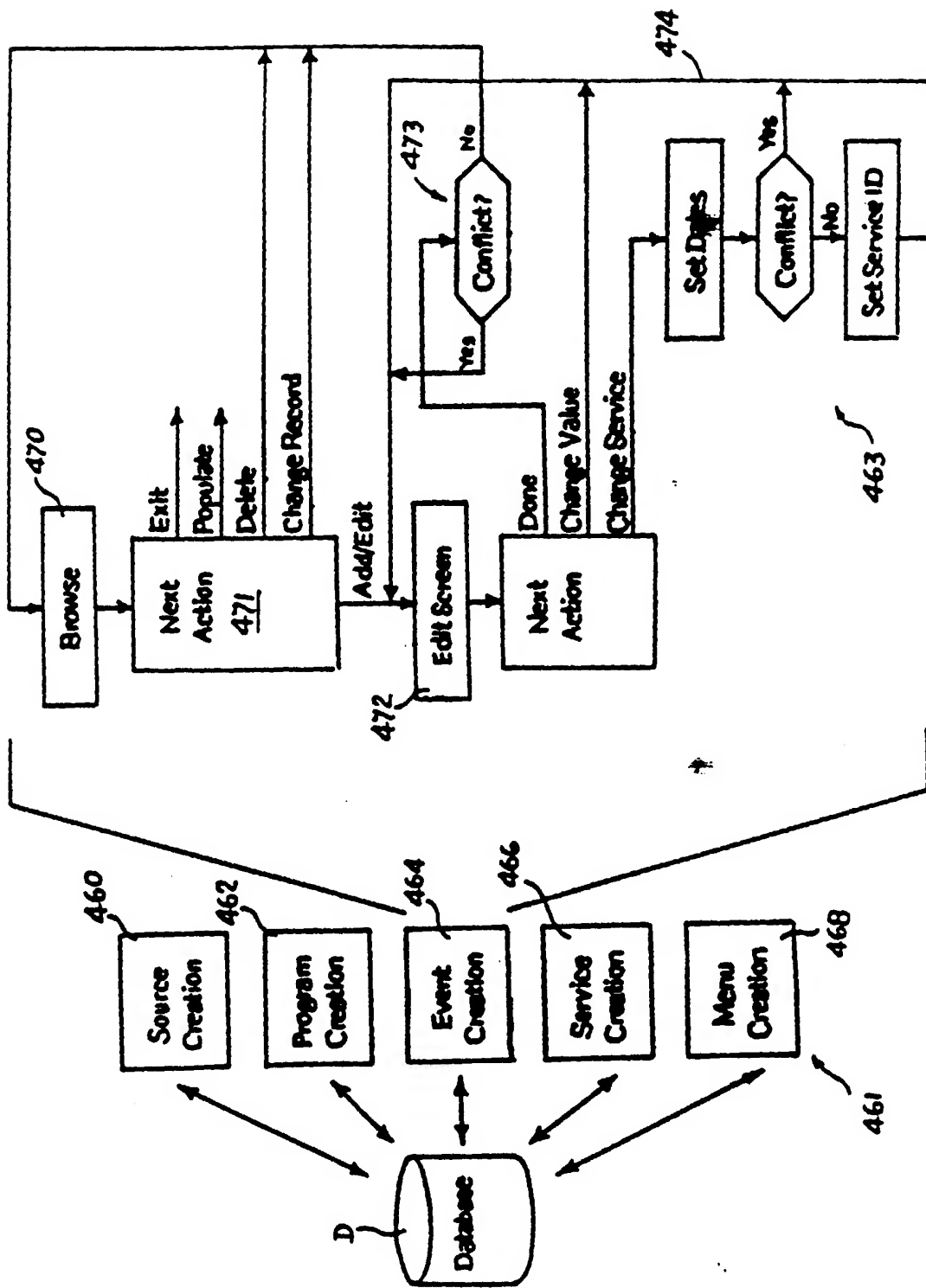


Fig. 9

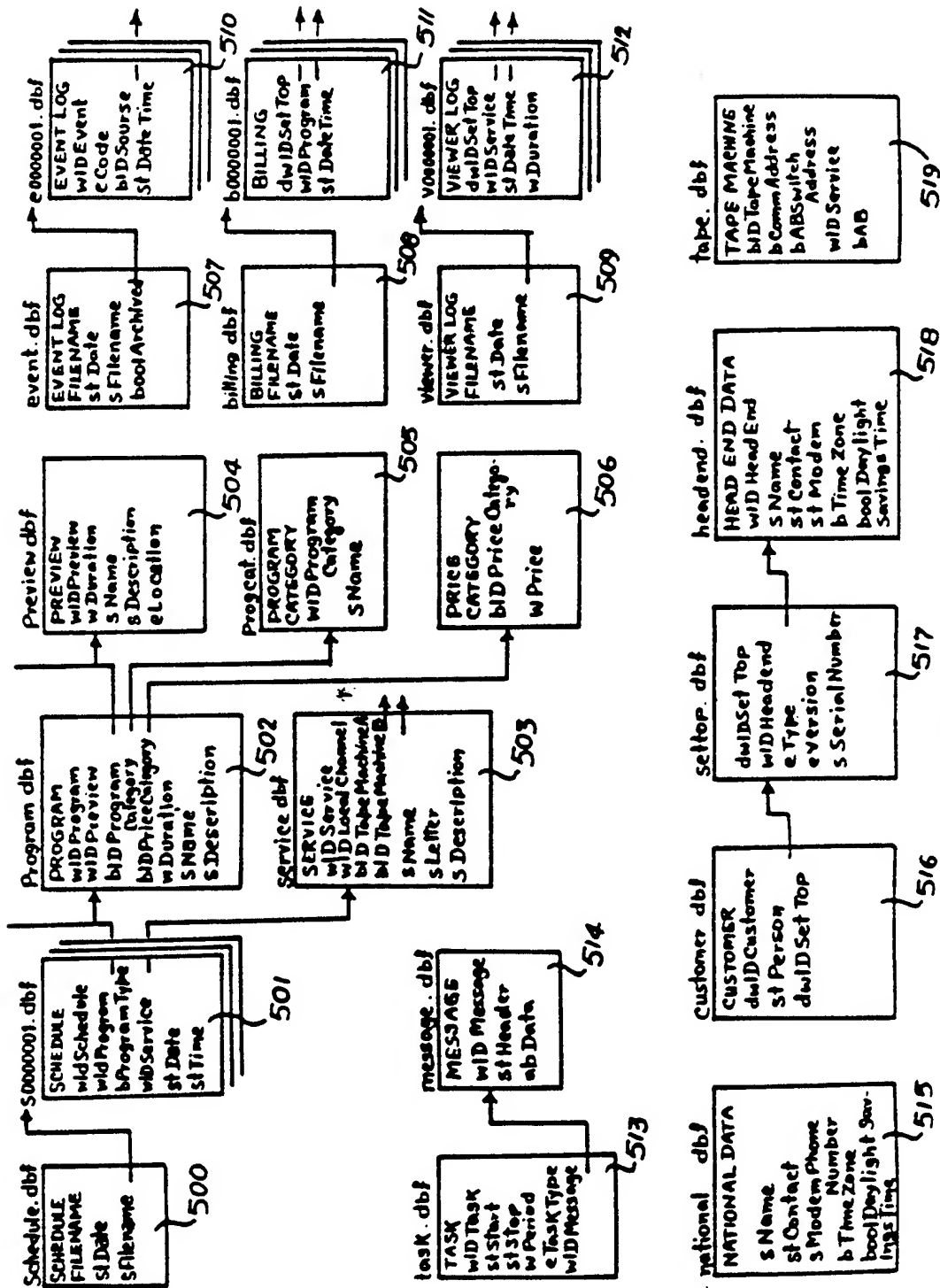


Fig. 10

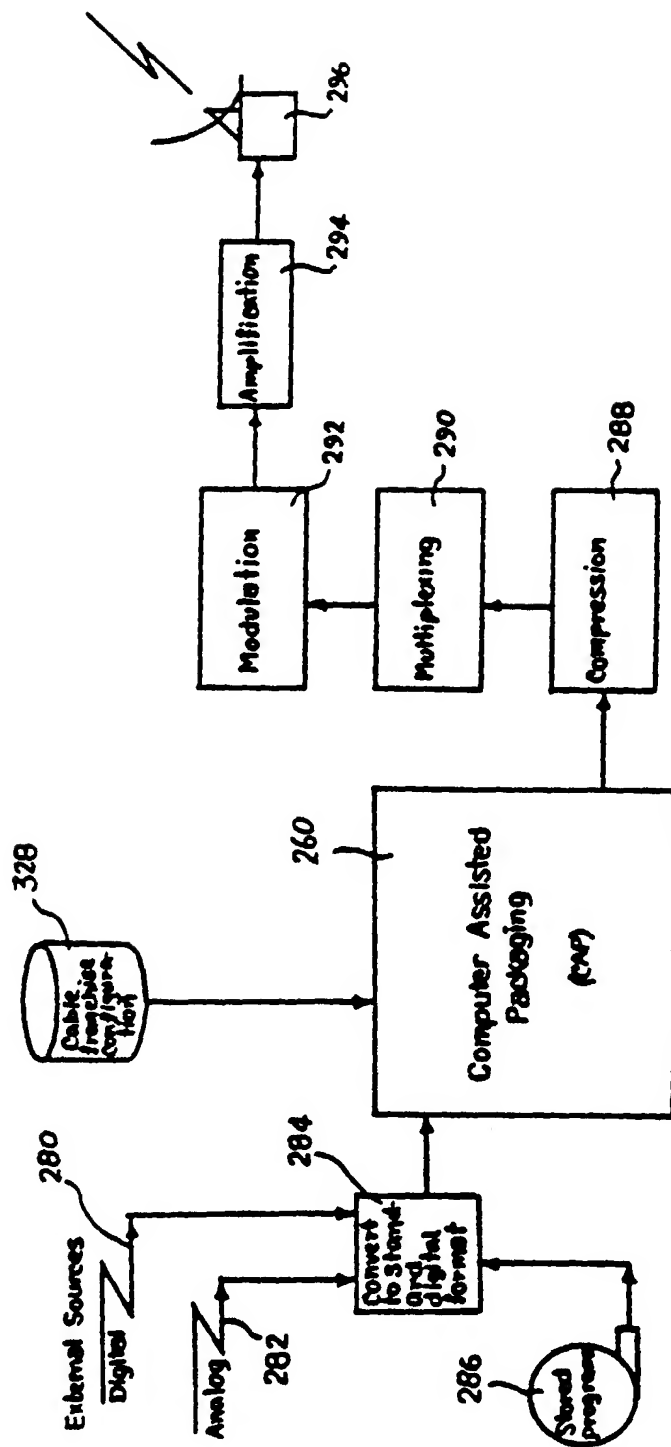


Fig. 11

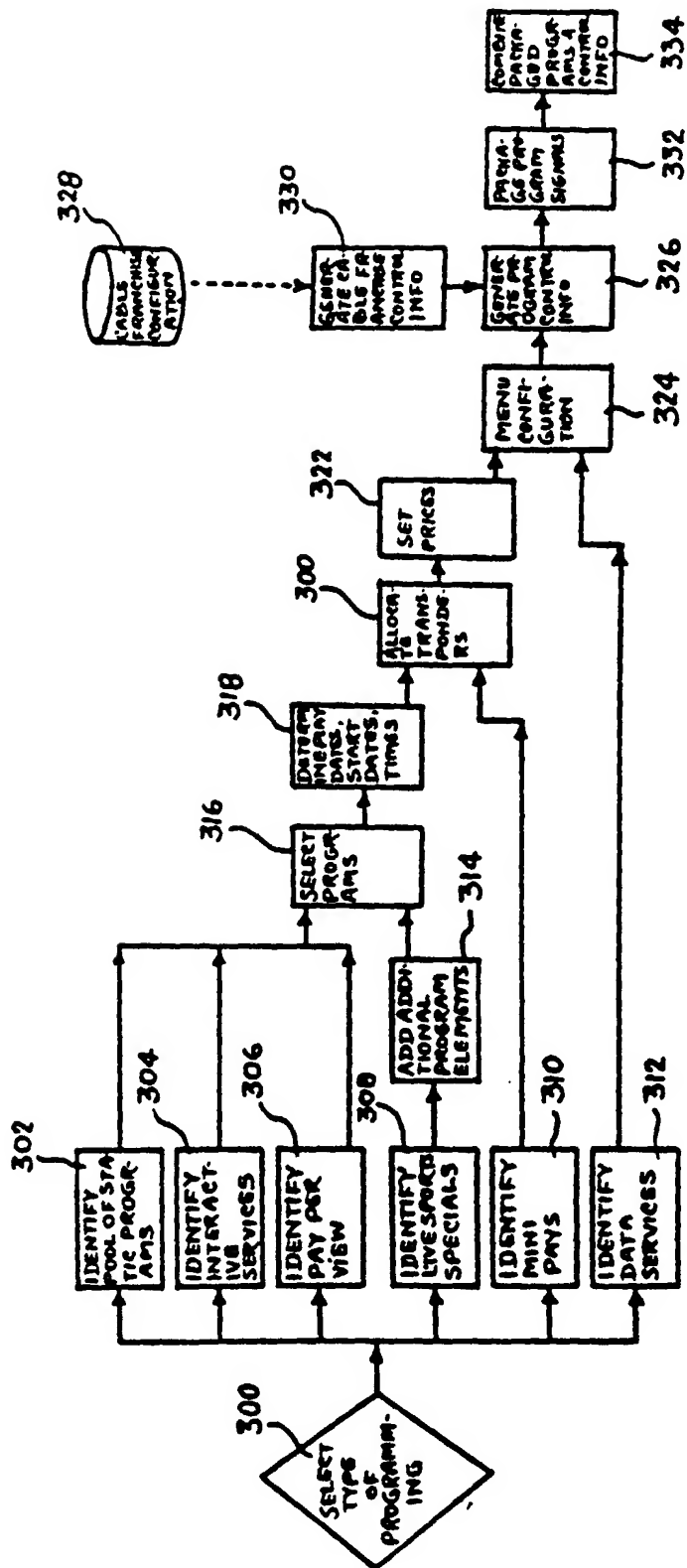
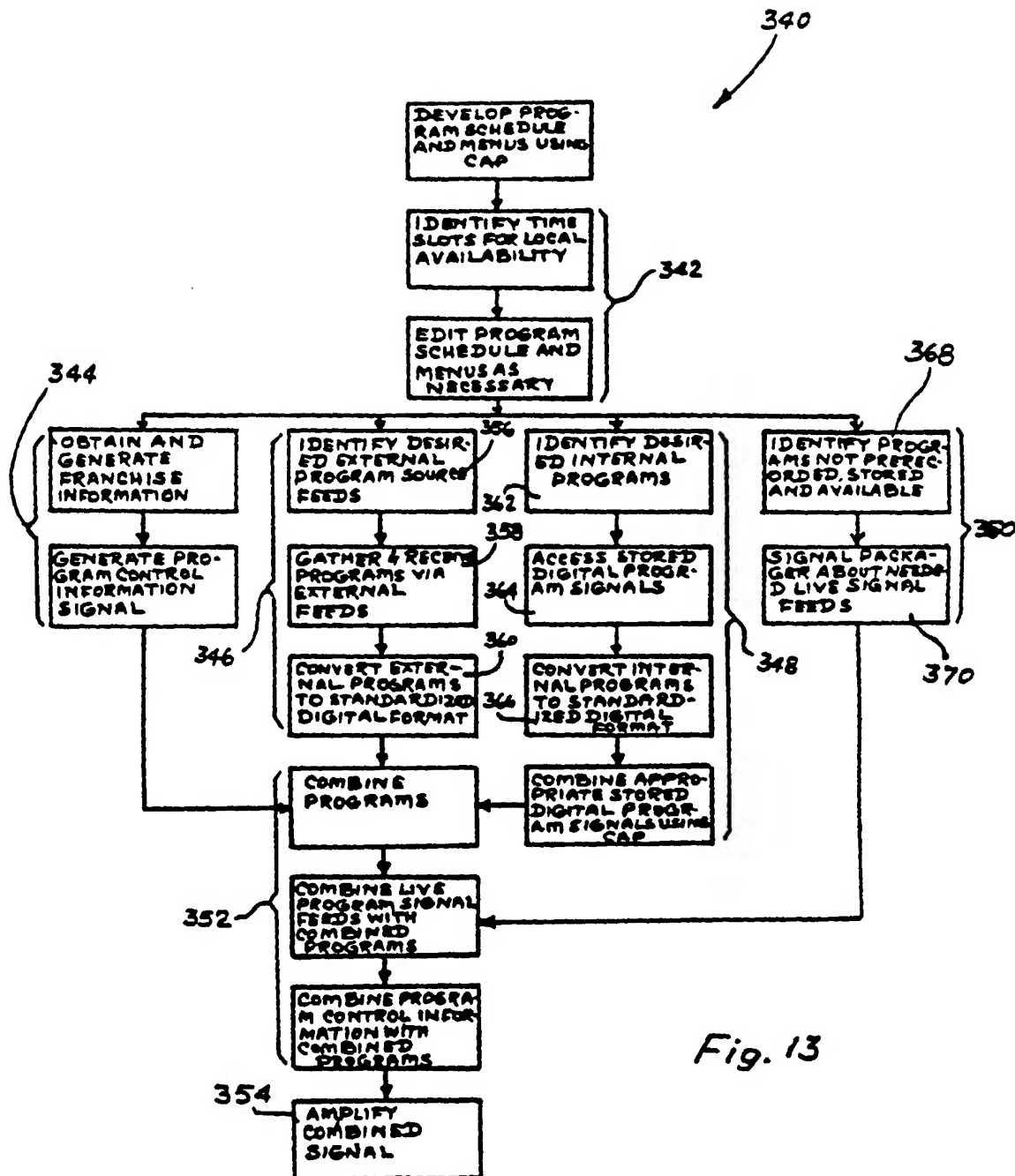
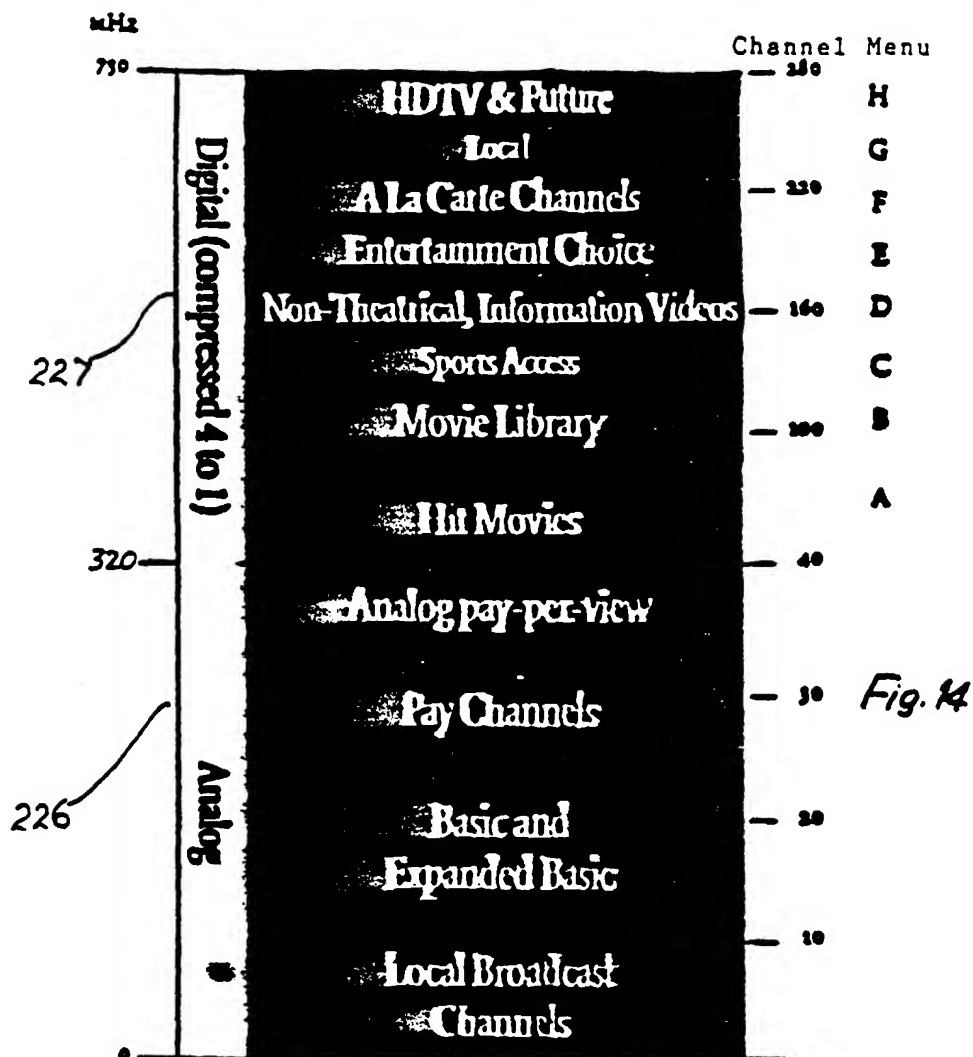


Fig. 12

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CHANNEL MENU	PROGRAMMING CATEGORY	CHANNELS ALLOCATED
A	Movies	50
B	Sports	2
C	Childrens	3
D	Documentary	14
E	Entertainment	10
F	Specialty Channels	15
G	Local	N/A
H	HDTV	4
I	Interactive	2
	COMBINED	100

Fig. 15

SATELLITE MOVIE  
OPTIONS





















VTV Combo	Comp. Ratio	AVAILABLE MENUS (1, 2, & 3)	PRIORITY ONE MENUS	PRIORITY ONE PLUS TWO MENUS
1	8:1	 HIT MOVIES 8 movie Selections with start times every 15 min.	 HIT MOVIES 6 movie Selections with start times every 30 minutes	 HIT MOVIES 6 movie Selections with start times every 15 minutes
2	8:1			
3	8:1			
4	8:1			
5	8:1			
6	8:1			
7	8:1			
8	8:1			
9	4:1	 SPORTS 8 Selections	 SPORTS Selections	 SPORTS Selections
10	4:1			
11	8:1	 CHILDRENS 8 Selections	 CHILDRENS Selections	 CHILDRENS Selections
12	8:1	 Docs/News 8 Selections	 Docs/News Selections	 Docs/News Selections
13	8:1	 Entertainment 8 Selections	 Entertainment Selections	 Entertainment Selections
14	8:1	 Special Interest Channels 8 Selections	 Special Interest Channels Selections	 Special Interest Channels Selections
15	8:1			
16	8:1	Promos (1/6 Screen) 48	Promos (1/6 Screen) 48	Promos (1/6 Screen) 48
17	8:1	Data Stream	Data Stream	Data Stream
18	8:1	 MUSIC 32 digit Station	 MUSIC 32 digit Station	 MUSIC 32 digit Station

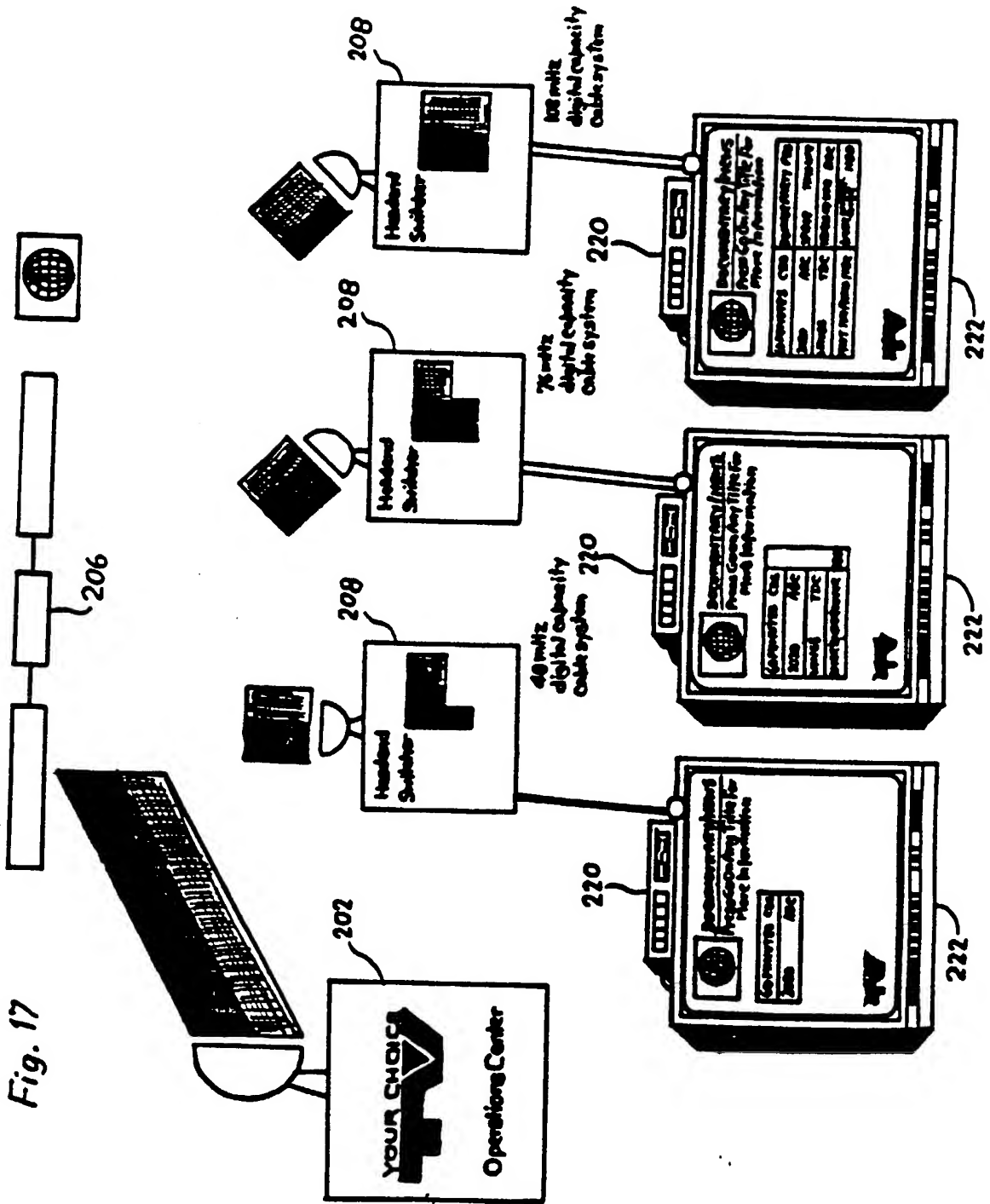
Fig. 16

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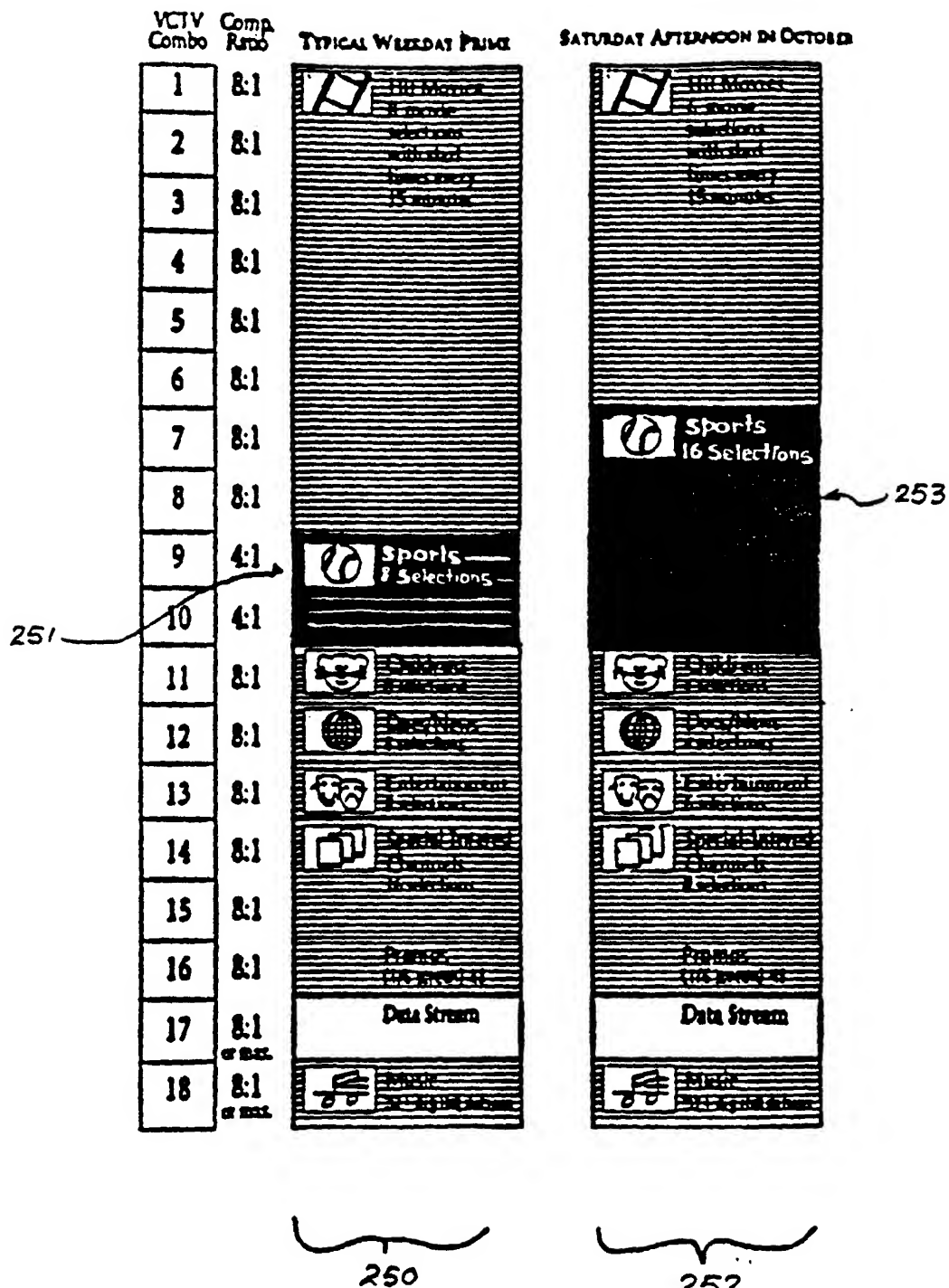
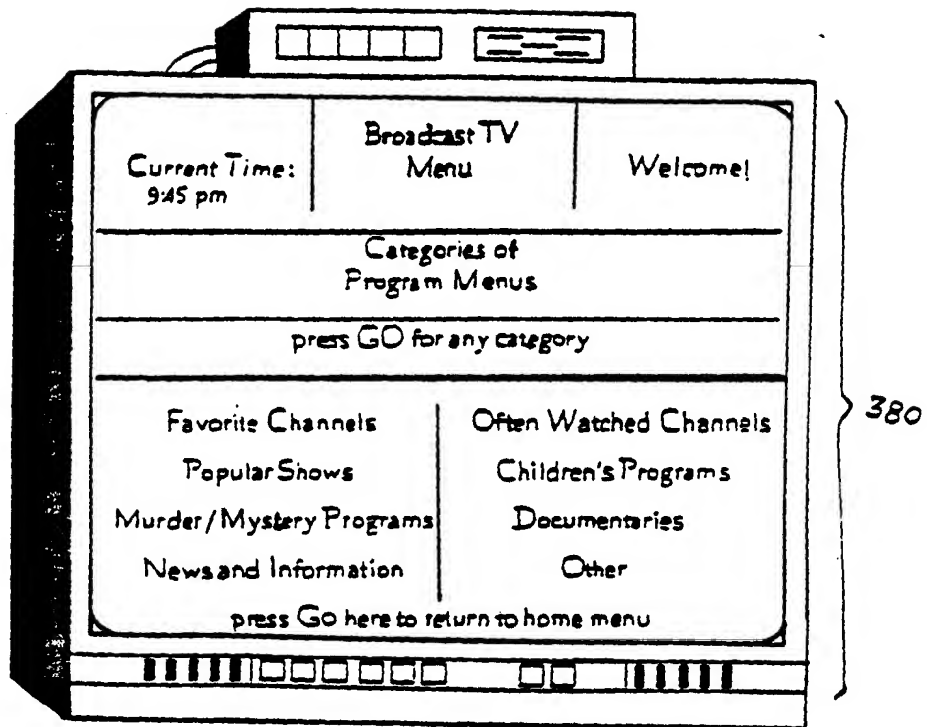


Fig 18

Fig. 19



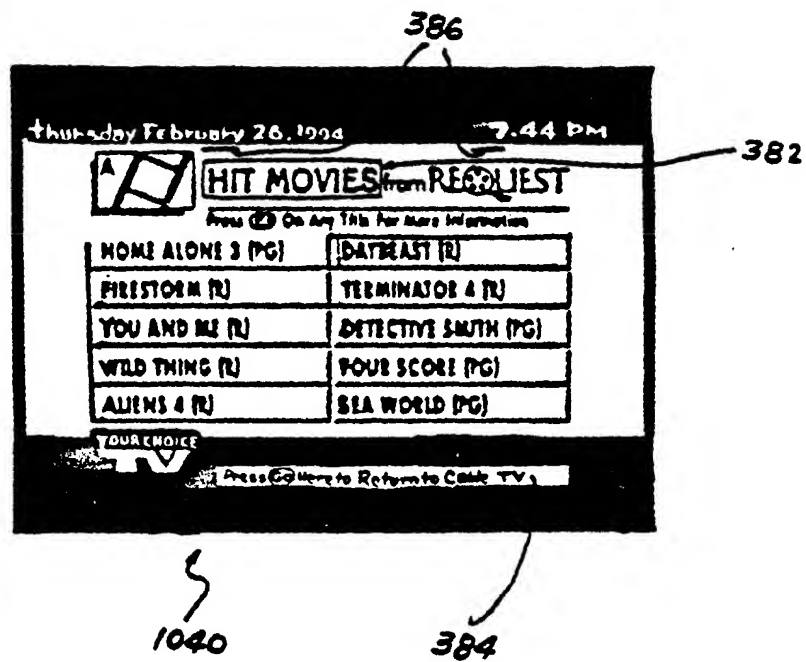
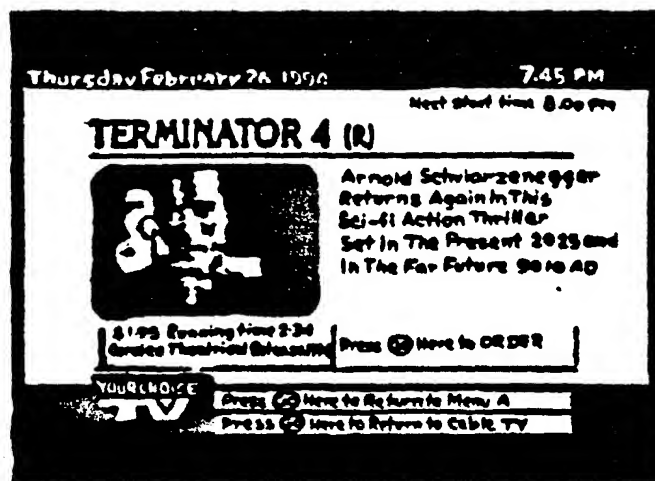


Fig. 20



↑  
1120

Fig. 21



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# EUROPEAN SEARCH REPORT

Application Number  
EP 99 11 0233

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A	* the whole document *	2-16, 18-20, 22-37, 39-59, 61-67, 69-72, 74-78, 80, 81	
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The present search report has been drawn up for all claims			
Place of search BERLIN		Date of completion of the search 11 August 1999	Examiner Greve, M
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone  Y : particularly relevant if combined with another document of the same category  A : technological background  O : non-written disclosure  P : intermediate document</p> <p>T : theory or principle underlying the invention  E : earlier patent document, but published on, or after the filing date  D : document cited in the application  L : document cited for other reasons</p> <p>&amp; : member of the same patent family, corresponding document</p>			

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Application Number  
EP 99 11 0233

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Place of search BERLIN		Date of completion of the search 11 August 1999	Examiner Greve, M
<p><b>CATEGORY OF CITED DOCUMENTS</b></p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons</p> <p>&amp; : member of the same patent family, corresponding document</p>			

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Abstract:

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